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History of Saint-Gobain Plate Glass Company[1]

THE history of the Saint-Gobain Plate Glass Company is of interest to the American glass manufacturer, as it shows the development through a period of 263 years of what is now one of the most powerful organizations in the world, devoted to glass manufacture in its different branches. The recent establishment of the Blue Ridge Glass Corporation's plant by this concern at Kingsport, Tennessee, in combination with the Corning Glass Works and the Belgian National Glass Works has served to increase the importance of this organization to the American glass industry.

THE Saint-Gobain Company is one of the oldest industrial organizations in the world. It was established in the year 1665 by the great French economist Colbert.

Before that date the manufacture of mirrors was an art of which only the republic of Venice possessed the secret, which it guarded with great vigilance. The manufacture of mirror glass was carried on in great secrecy, on the island of Murano, and severe punishment awaited those who would make an attempt to transfer this art to foreign lands; confiscation of property, banishment, and death of the family of the transgressor served to detain those who contemplated leaving Murano to practice the art of mirror manufacture elsewhere. All efforts made to introduce the art of mirror making in France were unsuccessful until the time of Colbert, the industrial pioneer.

JEAN BAPTISTE COLBERT, MARQUIS DE SEIGNELAY
Founder of Saint-Gobain Plate Glass Company, 1665

When the latter was appointed by Louis XIV as advisor, he realized at once the necessity of establishing in France those industries which were draining the country of its gold resources, and he resolved to give to France a number of industries which would serve to establish a favorable balance of trade.

In 1664 he conceived the idea of establishing a plate glass factory in the kingdom. He succeeded in inducing glass workers to come to France from Venice, and in 1665 founded the "Compagnie des Glaces." The first factory was built in one of the suburbs of Paris, where plate glass was made until 1666. But the glass was of a very imperfect nature, and the Venetian glass workers would work only when unobserved. Colbert then turned to Lucas de Nehou, who since 1653 had enjoyed the privilege of making crystal and window glass, in a factory located at Tourlaville, in the forest of Brix near Cherbourg. These glass workers had found the secret of making colorless glass, and were very proficient in their art. Colbert ordered them to work in the "compagnie des Glaces," and to undertake to make plate glass in this factory. Nehou learned rapidly how to make mirror glass, and the Venetians were sent back to their own country. The mirrors which adorn the Palais of Versailles were made entirely by French workmen. They were made of glass blown into cylinders and subsequently flattened, ground and polished. In 1688 a new era commenced for the industry. Louis Lucas de Nehou,

[1] MANUFACTURES DES GLACES ET PRODUITS CHIMIQUES DE SAINT-GOBAIN ET CIREY.

THE CHANTEREINE GLASS WORKS AND PART OF THE VILLAGE OF THOUROTTE (OISE)

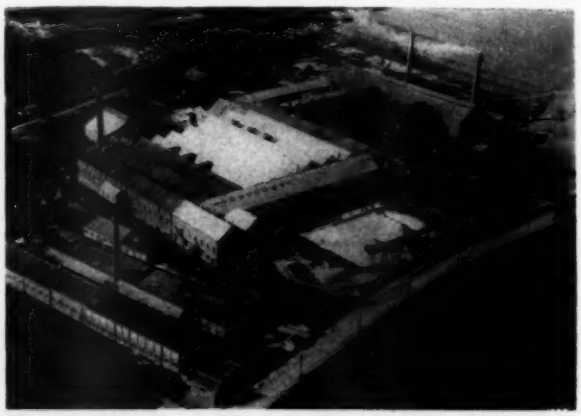
who applied to the manufacture of mirrors the casting process invented by Perreau in 1687, a glass maker from Orleans, found in this manner a way to cast plate glass. In 1691 he succeeded in making much larger and more beautiful mirrors than had previously been possible by the blowing process.

The importance of this invention is evident when it is considered that the principle of Nehou's invention is still being used in plate glass manufacturing, except in the Bicheroux process, the Ford process and the method developed by the Pittsburgh Plate Glass Company.

The manufacture of cast plate glass was begun in 1693, in a new factory, built on the ruins of the castle of Saint-Gobain, in Picardy, near the river Oise, in the midst of a large forest, which supplied the fuel for the melting process. Lucas de Nehou directed the operations of the factory until 1695; at that time dissensions with the board of directors of the Company forced his retirement. But the lack of skill of his successors soon made itself felt, and the factory did not flourish, until he was recalled to Saint-Gobain in 1711. He perfected his process, built new furnaces, trained efficient employees, until his death in 1728.

The factory located in Paris had given up the manufacture of plate glass, but the grinding and polishing of the rough plate furnished by the glass works of Saint-Gobain and Tourlaville was continued for a long time in the suburb of Saint-Antoine. After the death of Lucas de Nehou, the glass works of Saint-Gobain continued first under the impetus given to it by its founder. But his successors who were often incapable, and in many cases unscrupulous caused its ruin. The factory was in a very disorganized condition, when the board of directors decided to give the management to Deslandes, who had entered the employ of the Saint-Gobain glass works in 1752 as a minor employe. Gifted with great intelligence, he had not failed to observe the errors made by his superiors, who frequently had refused to act on his advice. When he became manager, he re-established order, improved the methods of manufacture, decreased the production costs, enlarged the factory and perfected its management. He began to grind plate glass at Saint-Gobain in 1769; in 1773 he installed apparatus to polish plate glass. From then on the plate glass from Saint-Gobain was sent polished to the warehouses in Paris. The mirrors from Saint-Gobain became the largest and finest in Europe, and at the same time the least expensive. What would cost 1,000 pounds abroad would cost only 250 pounds in Paris. In spite of the competition of factories established in England, Germany and Spain, the Saint-Gobain Company greatly increased the consumption of plate glass in France, and its sales abroad.

Deslandes retired in 1789, after having brought to the Saint-Gobain Company many honors and great prosperity. But soon the political situation threatened to bring about disorganization and perhaps ruin, had it not been for the fact that Deslandes had greatly improved the material conditions of the workmen of the factory, and had done much to develop a family spirit in the glass works. The governing board, which had a progressive spirit had facilitated these reforms. For this reason the Company had a number of devoted employes, who remained faithful. On the other hand, the governing board itself, which counted among its numbers great nobles, citizens of Paris and bankers of Geneva, was on good terms with the revolutionary committees. Some employes left the country, and their possessions were confiscated for the benefit of the nation. But they were not distributed or sold, so that their original holders eventually received them back.

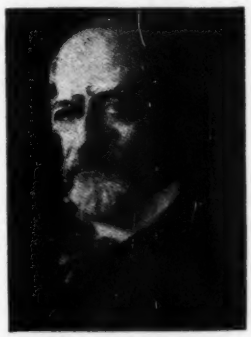


AT SAS-DE-GAND, HOLLAND.
New Society of the Netherlands Plate Glass Works. Glass and Chemical Products. Built in 1926.

While the glass works of Tourlaville were given up in 1792, those at Saint-Gobain, after a short period of closing down, were re-opened in the same year, and the work begun anew. In 1796 the Company bought the old mills of

Chauny, where grinding and polishing machinery was installed, utilizing water power. Only in the years 1794 and 1797 no dividends were disbursed. At the opening of the nineteenth century the Saint-Gobain Company had regained its full activity.

A competing concern, the "Compagnie de Saint-Quirin," which had suffered severely from the revolution, started to make plate glass in 1804, and in 1817 bought the glass works of Cirey, which were made into plate glass works in 1822.[2]



LUCIEN DELLOYE
Director General, Soc. St. Gobain Chauny et Cirey.

At the plate glass works of Cirey the first efforts were made to use rotating tables for the grinding and polishing of plate glass, which experiments form the basis of the present method of grinding and polishing. No other great technical progress was made until 1852, the year in which Hector Biver took charge of the management of the Saint-Gobain factory. Towards 1850 experiments had been made to substitute coal instead of wood for heating purposes, but the quality of the glass thus obtained left much to be desired. A great step in advance was the introduction of furnaces, heated with gas with regeneration of heat, of the Siemens type. This method of heating is still in use in all plate glass works. In 1863 Biver made experiments to do all of the grinding and polishing on one side of the glass without removing it, and then subsequently to finish the other side. Heretofore the plate glass had been ground on rotating tables, and was then polished on apparatus of a different kind. The equipment thus developed was adopted in all of the Companies' glass works. This was an important step in advance. However, grinding in this manner was less efficiently done than when the rotating tables were used, which were the best mechanical solution of the problem.

Mr. Lucien Delloye, the present general manager of the glass works, constructed for the plate glass works of Chauny the first equipment for polishing on a rotating table, which, combined with the grinding tables made it possible to conduct the complete grinding and polishing operations according to the same principle. Certain inherent mechanical difficulties on which the polishing was based were overcome, and after more experimentation a completely satisfactory apparatus was built at the glass works of Cirey. This method is still used in the leading plate glass works of the world.

While from a technical standpoint the Saint-Gobain Company had accomplished great progress, of universal importance, it had also extended itself commercially, and had established its ramifications throughout the world. First in 1830 the two Companies of Saint-Gobain and of Saint-Quirin had come to an agreement with regard to the sale of their products in France. Thus united, they were better able to cope with the competition of the plate glass works of Montluçon, founded in 1846 by a former vice-president of the Saint-Gobain Company.

In order to increase its zone of influence abroad, the Saint-Quirin glass works first established a plate glass works at Mannheim, Germany, which caused serious competition to the Stolberg glass works, founded two years previously by the "Société d'Aix la Chapelle." The following year the battle between the two French companies ended by their fusion. The new company bought the glass works of Stolberg in 1864, and those of Montluçon in 1868. Pursuing further its policy of expansion, the Company constructed in 1888 a new factory in Pisa, Italy, and in the year 1900, to facilitate its export trade in Belgium, the glass works of Franière were built. By obtaining stock interest in a number of foreign glass manufacturing concerns, connections in other lands were established. Since 1899 the glass works of Altwasser in Silesia have been allied to the Saint-Gobain Company; in 1903 the glass works of Sas-de-Gand, in Holland, which were in bad financial condition were reorganized with the aid of the French concern. In 1906 a factory was built in Arija, Spain.

At the same time the Saint-Gobain Company began to take an interest in other branches of the glass industry. In 1912 in combination with other concerns, window glass factories were started at Aniche, and at Chalons-sur Saone, using the American Window Glass Company's process for the manufacture of window glass.

The war interrupted the progress of these enterprises. The factories of Saint-Gobain, Chauny, Cirey and Franière were demolished. To aid the national defense, the capacity of the glass works of Montluçon was doubled. In 1915, at the urgent demand of the French government, the Saint-Gobain company undertook the manufacture of optical glass and constructed for that purpose a factory on land adjacent to the glass works of Bagneaux.

After the establishment of peace, a program of reconstruction was at once entered upon. The Company decided to re-establish at Saint-Gobain only the manufacture of cast glass and molded glass, begun in 1864. The glass works of Cirey and Franière were rebuilt. A new factory, replacing the works formerly at Saint-Gobain and of Chauny was built at Thourotte, near Compiègne. At the same time the Company continued its policy of acquiring interests in different glass factories, producing products other than plate glass. In 1918 it participated in the formation of bottle works, at Denain, Frais-Marais, Escaupont and Dorignies. In 1919 it obtained an interest in the Boucher glass works at Cognac, in 1922 it took a considerable share in the Pyrex company, and established glass works at Bagneux for the manufacture of this glass, especially resistant to great changes in temperature. An interest was also acquired in a factory built for the purpose of making fused quartz

[2] In 1859 this concern was amalgamated with the Saint-Gobain Company.

glass. In 1924 it obtained the long-established factory of Parras-Mantois, in which optical glass is being made. Interests were acquired in a number of glass works in England, Germany, Spain, Italy and Czechoslovakia. Recently the Saint-Gobain Company has taken part in the establishment of the Blue Ridge Glass Corporation's factory at Kingsport, Tennessee, built for the purpose of making cast glass and wire glass, in co-operation with the Corning Glass Works, and Glaceries Nationales Belge.

The many scientific problems which constantly have to be solved, led to the establishment of a glass research laboratory, devoted to the study of special glasses, refractory materials, etc., utilizing the most modern equipment of physics and chemistry. Experiments on a semi-plant scale aid in bringing to a practical application the results obtained in the laboratories.

Deslandes, in his day, entertained close contact with the great scientists of his time, and was a correspondent member of the Academy of Sciences. Continuing this policy, the Saint-Gobain Company is in close contact with scientific, industrial and commercial centers of Europe and America, and assures itself in this manner of the most complete results of scientific and economic investigation with the object of continuing to lead in the progress in all of its chosen fields of activity.

The Saint-Gobain Company follows incessantly its fixed purpose which leads to a double result; first: to perfect its methods from the technical standpoint, and to hasten progress by putting at the disposal of all of its ramifications the common experience acquired by the specialists of the various branches of the glass industry, and second, to prevent ruinous crises, especially to the small industries, by entertaining friendly relationships with the glass makers of numerous countries.

On this road, under the leadership of the eminent men who guide its destinies, the Saint-Gobain Plate Glass Company has already accomplished a great industrial work, and is contributing to extend the French influence abroad.

For the above information, acknowledgement is made hereby to the officials of the Saint-Gobain Company.—EDITOR.

The Breaking Strength of the Glasses as a Function of the Composition

By Oscar Knapp[1]

OF the artificially produced materials that human work has obtained glass together with iron, is used the most. Its excellent properties, transparency, brightness, the possibility of varied coloring, high strength and hardness, easy working and shaping, would assure it first place among all natural and artificial materials if these good properties were not connected with undesired brittleness. We also can readily understand that for a long time the glass makers have discussed the question of how glass could be compounded so that it would be unshatterable. In the history of glass manufacture there is found repeatedly the idea of the production of unshatterable glass. Even though these efforts have been unsuccessful up to the present, the resistance to fracture could be increased to an astounding extent, and special glasses are made that to a great extent are mechanically resistant and stable toward heat.

The loads that cause fracture after certain limiting values are reached may vary. Compression, tension, torsion, flexure, impact, sudden temperature differences, internal stresses are different causes that, acting on the glass, can overcome its resistance and lead to fracture.

The different mechanical properties of the glasses have been investigated thoroughly by various research men. Schott, Winkelmann, Paalhorn, Graf, Föppl, Turner and a large number of glass technologists have determined the values of the mechanical constants of glasses of different compositions, and in most cases have found an additive action of the influence of the individual oxides. The results obtained have shown that the mechanical properties in addition to the composition, also depend on the dimensions of the glass objects.

Even though these investigations and the derived additive law for the individual mechanical properties give the glass technologists important explanations and valuable fundamentals, they do not help the practical man in the solution of the problem of the kind of fracture-proof glasses to melt. In experiments on a small scale the conditions can be chosen in such a manner that only one of the mechanical properties can be considered in the glass and thus theoretically it can only be compared with objects of equal dimensions. In practice however, it is only in the rarest case that but one of the properties mentioned comes into question; almost generally the influence of several constants is present simultaneously and the fracture takes place as the result of influences that could not be kept out.

The first investigators who studied the fracture conditions from the viewpoint of actual practice were Winkelmann

TABLE 1

No.	Glass	W	T	log T
1	W 20	3.5	61.9	1.79
2	W 27	4.3	62.7	1.80
3	W 33	5.9	87.0	1.94
4	W 26	6.4	88.5	1.95
5	W 28	7.0	88.4	1.95
6	W 24	7.5	98.5	1.99
7	W 13	7.5	50.5	1.71
8	W 23	8.4	90.5	1.96
9	W 25	9.7	103.5	2.01
10	W 22	10.4	103.5	2.01
11	W 34	12.2	148.0	2.17
12	W 21	12.3	148.0	2.17

[1] Chemical Engineer, Glassworks "Tokod," Hungary, in *Die Glas-Industrie* v. 35, pp. 245-47.

and Schott, who took up the behavior of glasses under sudden changes in temperature, the so-called thermal impact. Starting from certain theoretical assumptions, they set up the following relation:

$$\text{Thermal strength} = \frac{\text{Tensile strength}}{\text{Expansion x Elasticity}} \times \sqrt{\frac{\text{Thermal conductivity}}{\text{Specific gravity x Specific heat}}}$$

or, expressed in a formula:

$$W = \frac{P}{a.E}\sqrt{\frac{k}{s.c}}$$

In order to be able to confirm the correctness of this formula, Winkelmann and Schott made polished cubes from the glasses investigated, heated them in water, or if temperature above 100° were necessary, in glycerine, and after reaching the desired temperature, suddenly cooled them to room temperature by dipping them into cold water. There were determined the temperature differences withstood by the samples without breaking. The results which were obtained with cubes 1 cm on an edge are given in Table 1, with information on the value T of the temperature differences, and the thermal strengths W. In order to show the uniformity of the relations between thermal impact and thermal strength, I have put these figures in a diagram, from which, as Fig. 1

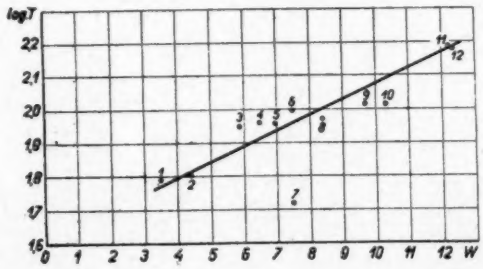


FIG. 1.

shows, it is evident that there is an agreement between the calculated values of W and the logarithmic thermal impact values. Glass number 7 is an exception, and to a noteworthy extent, whose deviation could not be explained even by Winkelmann and Schott. In the case of the other glasses the agreement can be considered as very good if we consider that the sources of error arising in the calculation of the individual properties may be additive in the calculation of the thermal strength value, so that the values obtained have a thermal resistant glasses such as apparatus glass, glass for certain unreliability. Also, in these investigations glasses not completely relieved from stresses were used, and the magnitudes of the stresses in them were not considered. Nevertheless in spite of this inaccuracy the formula can be used for practical purposes and with it one would obtain thermal resistant glasses such as apparatus glass, glass for Welsbach lights and thermometer glass, which resist astonishingly sudden great changes in temperature.

A practical test that has been taken up officiallv in America, was worked out by the Bureau of Standards in Washington. Beakers made of the glass under investigation are filled with 200 cc of melted paraffine and then heated until the paraffine has a temperature of 215°. Then with constant stirring the temperature is reduced to 200° and the beaker immersed rapidly in ice-water. The number of resultant fractures is given in per cent. With heat resistant glasses the results tabulated in Table 2 were obtained, in

TABLE 2

No.	Glass	W	B	log B	h	log h
13	Kavalier	10.1	50	1.70	12.7	1.10
14	Nonsol	10.2	20	1.30	25.4	1.40
15	Fry	11.0	42	1.62	43.2	1.64
16	M. E. G. & Co.	11.8	40	1.60	19.1	1.28
17	Jena	14.5	30	1.48	25.4	1.40
18	Libbey	15.5	17	1.23	25.4	1.40
19	Pyrex	28.7	10	1.00	59.2	1.77

which B is the percentage fracture. In order to be able to determine the expected uniformity in these data, they were plotted in a diagram (Fig. 2) in which the heat resistance is the abscissa and the logarithmic value of the per cent fracture is the ordinate. We see from the diagram that between thermal strength and fracture with sudden change in temperature, which can be called thermal impact fracture, there

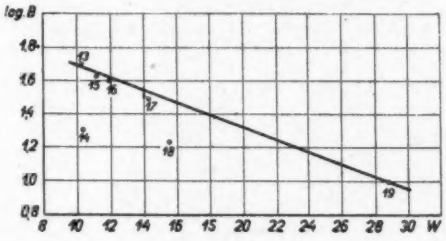


FIG. 2.

seems to be a regular relation although certain glasses show irregular behavior. The cause of the irregularity may find a partial explanation in that the beakers studied were only partially and unequally relieved of stresses, and in addition the dimensions of the different beakers were not the same. In spite of these variations the assumption seems to be correct that the Winkelmann formula holds not only for the test cubes but also for technical glasses if these are shaped the same and of almost equal dimensions.

However the fractures occurring in use are due to thermal impact only in cases in which the glass undergoes subsequent heat treatment. Another source of fracture can be as a result of mechanical impact or by falling. The Bureau of Standards has worked out a dropping test in order to be able to observe the fractures on falling. Beakers of different composition but the same size are allowed to drop with the bottom down on a board 3.8 cm. thick from a height increasing from 12.7 cm. until fracture results or until a height of 104 cm. is reached without fracture. In these investigations the stress conditions are also observed. Of all the data obtained, I have only considered that for the slightly stressed glasses and glasses in which the stress has been removed, and averaged the dropping heights which many times differed very greatly. The values are given in Table 2 where h is the dropping height.

In order to be able to reach a conclusion as to the breaking strength, I have assumed that of the different mechanical

properties that play a part in dropping and in impact, the tensile strength, the elasticity and the expansion are important and that on the other hand, the thermal properties and the specific gravity have no influence worth mentioning. In order to confirm or contradict this assumption I have calculated the values

$$\text{Impact strength} = \frac{\text{Tensile strength}}{\text{Expansion x Elasticity}}$$

or, expressed in a formula:

$$S = \frac{P}{a.E}$$

and compared the values obtained with the dropping heights or the logarithmic values of the dropping heights. The diagram (Fig. 3) obtained on the basis of this table (Table 3) shows that the existence of a uniformity can be stated although one glass differs from another.

As is clear from the calculation of the value $\sqrt{\frac{k}{s.c}}$ there are only slight variations with the glasses of different compositions. In the case of the heat resistant glasses these amount to only 0.0059 to 0.0068. The figures of the impact strength therefore are only changed a little when we multiply them by these values. In other words, this means that the Winkelmann thermal strength formula also holds for the impact by falling. The relation between the values W and the dropping height is given by the equation:

$$\log h = 0.992 + 0.027 \text{ cm.}$$

The relation between the W values and the temperature impact can also be formulated mathematically. The equation reads:

$$\log T = 1.6 + 0.046 \text{ W°C}$$

The breaking strength of the glasses therefore can be calculated by means of the Winkelmann formula as a function of the composition. However, this formula is valid only with de-stressed glasses.

In order to test the usefulness of the above equations, I have calculated the values of glasses, with the exception of the abnormal glasses No. 7 and 15, and compared them with the values found. As table 4 shows, the agreement is rather good. The equations for the dropping height and the thermal impact can be used in practice, and can serve as important aids in the production of the glasses.

TABLE 3

No.	S
13	153
14	175
15	174
16	188
17	226
18	238
19	422

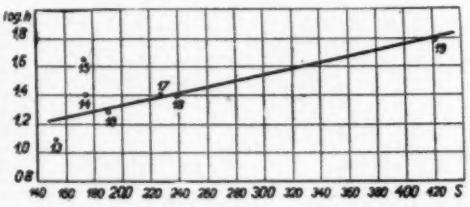
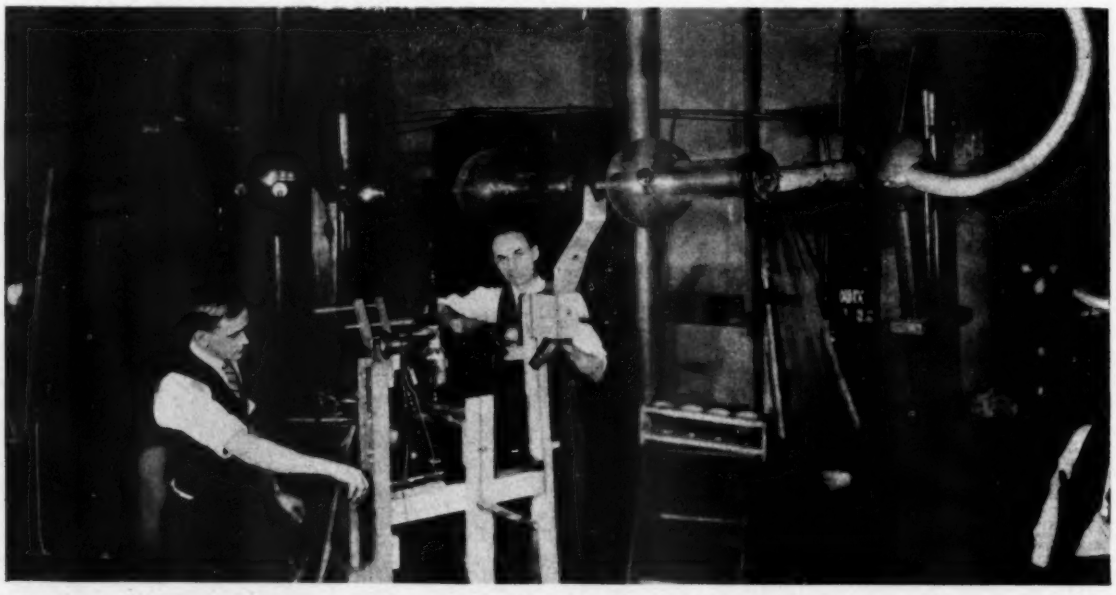


FIG. 3.

TABLE 4

Thermal Impact			Dropping Height		
Glass	Calculated	Found	Glass	Calculated	Found
1	58	62	13	18	13
2	63	63	14	19	25
3	74	87	16	20	19
4	78	89	17	24	25
5	84	88	18	26	25
6	88	99	19	59	59
8	97	91			
9	111	104			
10	119	104			
11	145	148			
12	147	148			



Experimental Triplex Cascade Cathode Ray Glass Tube

In the laboratory of Dr. W. D. Coolidge of the General Electric Company, Schenectady, N. Y., the cascade or multi-sectional system here illustrated has enabled Dr. Coolidge to operate the tube on 900,000 volts, three times as many as was previously attainable. The glass tube is about 95 inches long and has three bulbs each 12 inches in diameter. The electrons expelled from the tube, appearing in a ball of purplish haze, are shot forth at the rate of 175,000 miles per second, which is the fastest speed ever accelerated by man. This is about 350,000 times faster than the speed of a bullet shot from an army rifle. The glass tube is shielded with a copper tube so that the stream of electrons cannot strike the glass and cause punctures. The cascade system, Dr. Coolidge says, points to a vista of alluring scientific possibilities.

The Design of Plate Glass Polishing Machines

By F. W. Preston[1]

This is the concluding part (III) of the article written by Dr. Preston at the Editor's request, to explain the principles underlying the mathematical theory given in his paper of the same title published recently (June, 1927), in the Journal of the Society of Glass Technology. Part I was published in the February number. Part II appeared in the March number.

Continuous Polishing

But nowadays we are not concerned with the old-fashioned square table, but with a continuous succession of tables moving slowly along. If we suppose that a felt is shuttled backwards and forwards crosswise of this slowly moving series of tables, it will not gouge out a groove, for its track upon the deck will be displaced a fraction of an inch at every stroke, and all longitudinal sections like TT' (see

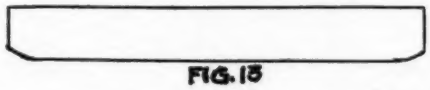


FIG. 13

March issue, page 58) will be "ideal." The distribution crosswise, that is along lines like SS', will, for such cases as we have been considering, be like Fig. 8 or Fig. 13.

But shuttling felts backward and forward is much less

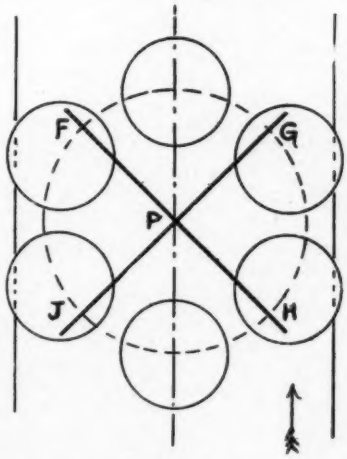


FIG. 14

FIG. 15

satisfactory and much less simple, purely as a mechanical matter, than carrying an annulus of felts with a rotary motion around a central axle as in Fig. 14. It is a simple matter to mount a spindle over the point P and to carry on this a spider or runner with a number of "blocks" or felts arranged in an annulus. Mechanically this arrangement is ideal—exceedingly simple, nothing to go wrong—but it does not produce an even polish. If the table travels slowly in the direction of the arrow and we examine a cross section of it after it has passed completely under the machine, we find that the polish-distribution is as in Fig. 15.

Why it takes this form will be best comprehended by reference to my original paper, but it may be crudely ex-

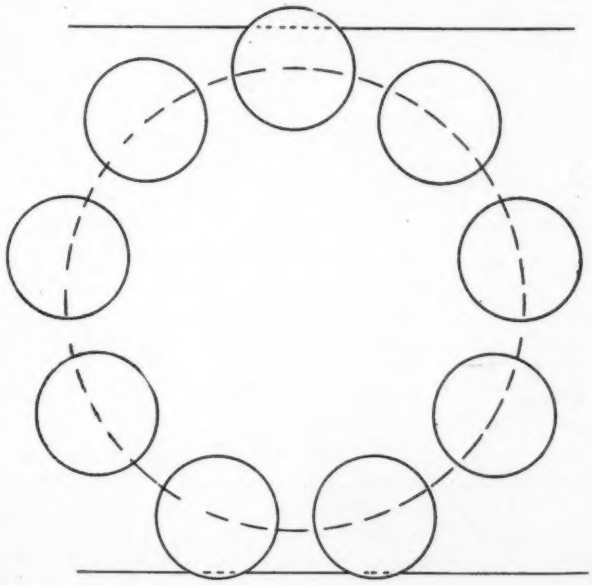


FIG. 16

FIG. 17

pressed this way. If I draw two lines at 45 degrees through P, meeting the pitch-circle of the felt-annulus in F G H J, then any quadrant such as FG contains as much felt as any other, say GH. But the quadrant FG is spreading its effort over about seven-tenths of the width of the table while the quadrant GH is concentrating its effort on about three-tenths of the table width. If this were a full statement, it would seem that near the edge the table polishes about twice as fast as near the centre: but in point of fact the statement is only a crude one, and we have to take into consideration the size of the felt and several other factors. It serves, however, to give an idea of the root of the trouble.

In Fig. 16 I show a relatively large annulus and in Fig. 17 the corresponding distribution of polish.

[1]Consulting Engineer, Leicester, England, and Butler, Pennsylvania.

To get over this waste of effort on the edges, it is natural to add a second row of felts inside the first.

This is shown diagrammatically in Fig. 18.

The theoretical effect of the second row is shown in Fig. 19a, and the combined polish-distribution of the two rows is shown in Fig. 19b.

Certain practical difficulties come in when we introduce a second row of felts, however. It is difficult to keep an inner row of felts correctly faced with rouge. Each block in an inner row does relatively little work, and so tends to stay cold. Special arrangements have to be made to feed them with rouge and water, and of water they do not evaporate enough to face themselves correctly. Again, they are relatively inaccessible, difficult to clean, and so on.

Fig. 14 resembles the polishers in use at the Detroit plant of the Ford Motor Company; Fig. 18 resembles in principle those at the Creighton plant of the Pittsburgh Plate Glass Company or, in part, some of those at the Butler plant of the Standard Plate Glass Company.

We now come to consider the rotary type of glass-polishing machines, that is, machines having a circular deck, as contrasted with the old-fashioned "square polishers" and the modern continuous types. Most of the plate glass plants of this country and of Europe are equipped with rotary machines, which are at the present time the most important economically. It is generally believed that their fate is, to be displaced ultimately by machines of the continuous type, but that time is not yet, and meanwhile owing to inefficient designs, the industry is wasting at least half a million dollars on them every year.

The rotary machine possesses certain fundamental advantages. Its quick-moving deck assures the rapid distribution of rouge; and what is more important, since each felt does approximately the same amount of work, all felts tend to run more nearly equally warm than on a "continuous" machine. Moreover the heat of polishing is more evenly distributed over the glass; the glass heats up in concentric zones, and if one zone tends to be hotter than another, it tends to be so during the whole run. On continuous machines the heat is spotty or localized, and the places of greatest heating change, so that every conceivable stress-system is set up in turn, and if one arrangement of stress does not break the glass another may. This fact has prevented the development of the continuous system for tables of great width, up to the present. The difficulty will no doubt be overcome but as yet the largest sheets of glass are made on rotary machines.

The principal difficulty with rotary machines, so far as getting a uniform polishing-distribution is concerned, lies in the fact that an annulus of felts working on it tends to polish the innermost zone more than the outermost.

Thus in Fig. 20, let the big circle represent the deck and the small circle be a row of felts on a runner. The table rotate. about O_1 and sets the runner turning about the axis O_2.

It is shown in the mathematical paper that if the axle of the runner be free from friction and the deck be equally wet all over, the runner will make as many revolutions per minute as the table. The consequence of this is that the

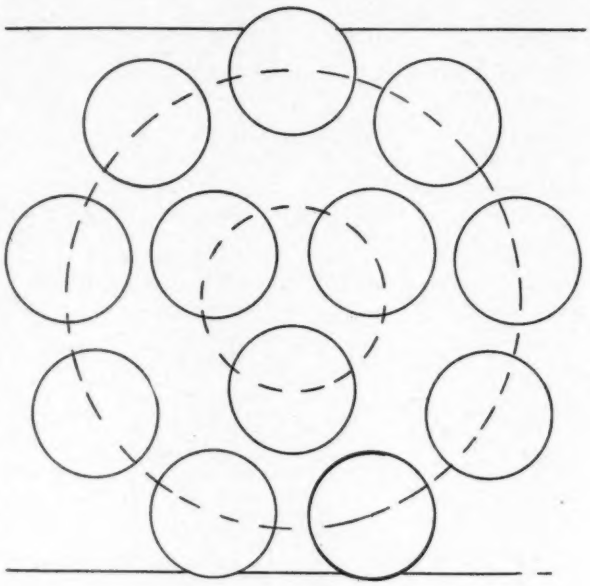


FIG. 18

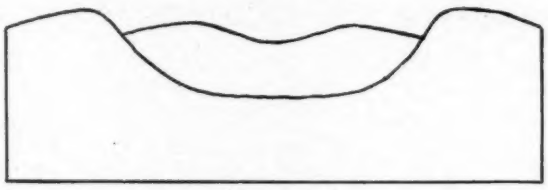


FIG. 19a

FIG. 19b

relative speed of a felt over the table or of the table under a felt, or in other words the speed with which the felt *rubs* the glass, is everywhere the same; it is in fact equal to the speed with which a spot on the table exactly under O_2—the axle of the runner—travels.

At the edge of the table, both table and runner are moving in the same direction, but the table is moving very much faster than the runner: it is *overtaking* the felts on the runner. There seems to be a curious belief in some shops that the runner and table are, so to speak, geared together by the edge and that the power to turn the runner comes from the grip of the felt on the edge of the table. So much is this the case, that on one occasion when the writer required a runner to be so placed that no felts on it reached the edge of the table, the shop objected that under such circumstances the runner would not turn. As a matter of fact the edge of the table has no special significance on gripping, and turning is totally independent of it—as was made obvious of course when the arrangement was tried.

Now given the fact that the runner makes as many revolutions as the deck—or nearly—and that the rubbing speed is everywhere the same, it is a relatively simple matter to

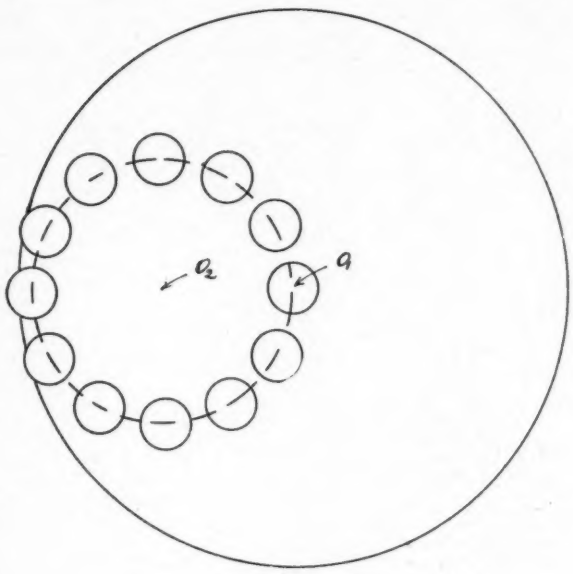


FIG. 20

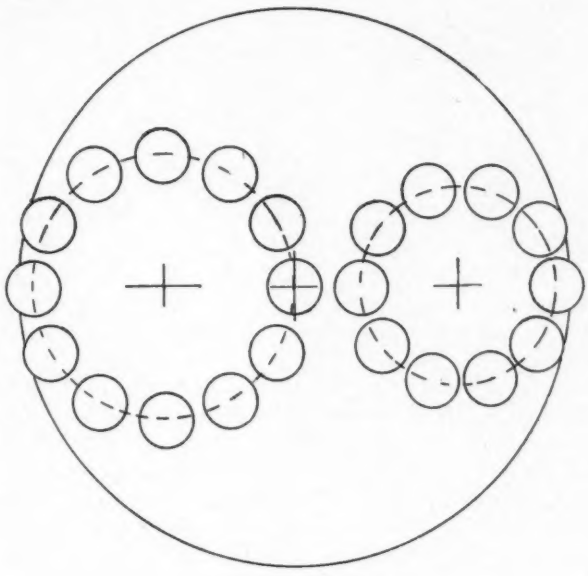


FIG. 22

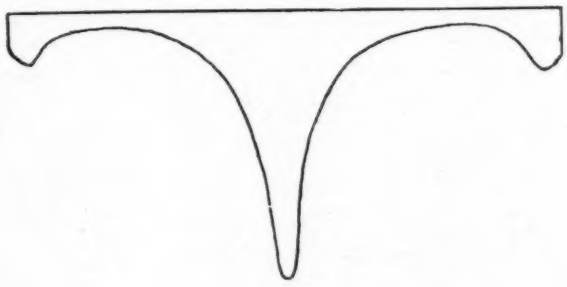


FIG. 21

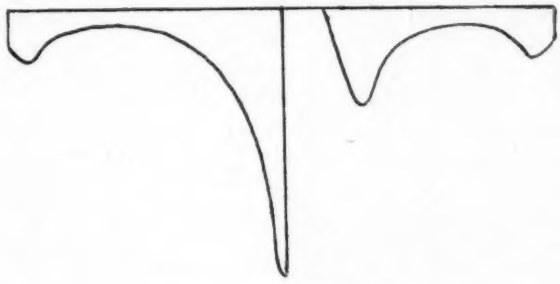


FIG. 23a

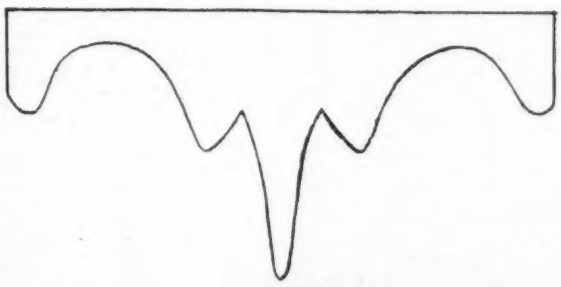


FIG. 23b

calculate the polish-distribution. For details as to how to do so the original paper must be consulted. For our present purpose it is sufficient to say that when worked out, it is found to be pretty much as in Fig. 21. This shows the distribution of polish along a diameter of the table. It is greatest at the axis and least about two-thirds of the distance from the centre to the edge. Towards the edge of the table it improves somewhat.

Now a single annulus of felts would, except on a very small machine, be a very slow-polishing arrangement. Therefore in all industrial machines other rows are added. They may be all on one large runner (an arrangement due to M. Lucien Delloye, President of the St. Gobain Company, and greatly used in Europe), or they may be arranged on several runners. The latter arrangement is apparently universal in English-speaking countries, though I am not sure it is the better.

It apparently arose in the days when, instead of a transfer system whereby the decks or tables could be removed from the machines, a couple of "carriages" were used, one for grinding and one for polishing, and these carriages could be manoeuvred on rails to come in turn over a deck which was an integral part of the driving machinery.

Such carriages were ungainly and cumbersome things at best, and when they were not in use they occupied a lot of space. But a carriage with two runners of moderate size occupies less space than a carriage with one huge runner nearly as big as a deck. It is presumably from some such consideration as this that our two and four-runner machines have developed. We still use two runners for grinding, though one runner is more logical in view of the experience of the optical and spectacle industries, the greater simplicity, and numerous other advantages. But of course it has one serious drawback—it leaves very little of the table exposed to view.

The earliest polishers of the fixed bridge and transferable deck type also had two runners, but soon a cross bridge was added and two small runners introduced to assist the others.

On the general principle that the more felts the quicker the polish, these were steps in a forward direction; but the more felts there are, the more power is needed, and although the polish was speeded up, it was attained at unnecessary cost, and the efficiency of a four-runner machine is not necessarily greater than a two-runner one.

Nowadays we have machines with six or more runners, stacking Ossa on Pelion as it were in an effort by multiplying felts to get at the slow zones, but it is not certain that the brilliant solution of M. Delloye—a bold reversal to a single runner,—is not the best, as it is certainly the most logical solution. There are however certain very special and very peculiar difficulties connected with the design of the single-runner machine, and it does not follow that if a machine has only one runner of the Delloye type, it is therefore a good machine. The machine shown for example in M. Delloye's United States patent is totally unworkable.

However, as English and American machines are universally of the many-runnered type, I do not propose to discuss the "tricks" and special precautions that must be observed in designing single-runner machines. This is the more so, since I have not discussed them in the mathematical paper.

Since the polish-distribution is necessarily symmetrical about the axis, we do not need to graph both sides as in Fig. 21. In Fig. 22 is shown a couple of runners with one row of felts apiece, and in Fig. 23a the polishing effort of each runner and in Fig. 23b the combined effort of the two.

And so we might go on and see what happens when we have four runners and perhaps two or more rows of felts on some or all of them.

For further details the original paper must be consulted: it shows how to calculate the efficiency as well as the distribution. The last section of the paper deals with possible consequences of de-synchronizing the runners. The fact that when left to themselves runners tend to synchronize themselves with the table, that is, to make the same number of revolutions per minute as the table, is connected with the fact that under these conditions they do a minimum amount of work. At any other speed—if they turned faster or slower, they would have to do more work, and therefore presumably more polishing.

Now it is not on the face of it likely that a speed which Nature sets because it corresponds to "least action" is precisely the speed we want. It is not even certain that it is the speed that should give the most *uniform* polish, and the paper proceeds to examine how the total effort and the distribution of polish are likely to be affected by compelling the runners to go at some other speed.

The mathematical aspect of the question is dealt with in the paper referred to, and some experimental work has been done on the subject. It is apparent from both angles that the subject is a somewhat complicated one, and I wish here to issue a note of warning that while the mathematical theory has proved remarkably accurate and successful in all other cases, I am not yet in a position to say how far it is in accord with experience when it comes to non-synchronized machines. It is perhaps just as well to have our theories running a little ahead of current practice, and therefore it seems advisable to publish the section referred to; the still more subtle developments of the theory, including those of the single runner machines, must await publication later.

For the present it is sufficient to state that by its means, improvements of 25 or 30 per cent have been effected in the production of a number of machines.[2]

[2]Patents have been applied for on some of the features incorporated in the writer's designs. The theory itself is, of course, not patentable, and the writer hopes that it may stimulate research and assist other designers.

The High Cost of Fuel Saving

By W. Trinks[1]

EVERY once in a while the question is raised why the glass industry does not use waste heat boilers, automatic CO_2 recorders and other appliances which will tend to save fuel. The present paper by the well known expert, W. Trinks, Professor of Mechanical Engineering of the Carnegie Institute of Technology, discusses these questions in an interesting and convincing manner. Germany has an Institute which gives advice to the glass industry as to how the fuel bill can be reduced, the Heat Economy Board of the German Glass Industry, with headquarters at Frankfurt, under the direction of Dr. H. Maurach. The German steel industry has such an Institute. We do not save fuel, because we do not need to—yet. The day is not far distant when we will be forced to do what common foresight dictates we should do now.—Editor.

FOR a number of years the phrase "the high cost of living" was quite familiar to us, but few among us have paid sufficient attention to the high cost of fuel saving.

That the saving of fuel and its conservation for future generations are desirable, is almost an axiom, about the truth of which there can be no discussion. But under the present economic order it is unfortunately cheaper to waste fuel than to save it, at least in many localities and under many circumstances.

[1]A paper presented by the author at the first National Meeting (1927) of the A. S. M. E. Fuels Division, St. Louis, Mo.

What is the cost of fuel saving? If we possess fuel-wasting equipment and consider replacing it by other equipment which saves fuel, the standard method of calculation is the following:

We ascertain the cost of the new equipment, including the cost of installation and of removal of the old equipment, minus the cost of salvage of old equipment, and compute interest, depreciation, amortization, also cost due to loss of use during the time of changing over. We add to this the cost of possible increases in labor, supervision, and maintenance, and compare the sum total with the fuel saving, at present market prices of fuel. If the saving sufficiently over-balances the cost items to make the change attractive, then, and only then, do we go ahead and install the fuel saving equipment. It always comes right down to dollars and cents, or immediate personal gain. Saving for future generations is never even considered.

Of examples for this state of affairs there are many. Twenty years ago the steel works were installing gas engines, because it was possible by their use to convert three times as much of the heat of the gas into mechanical work as could be done through the use of steam engines. But the steam turbine came along, steam pressures and temperatures rose, and the gap between the thermal efficiencies of the gas and steam units became smaller. Furthermore, the gas engines covered a "ten acre lot," while the turbo-machinery could be tucked away in a small corner of the building. Finally gas-engine repair costs were exceedingly high. Gas cylinders had to be replaced every five to eight years, piston-rod nuts and packing gave out with more or less regularity, and

the labor for intelligently operating and maintaining gas engines was not easily obtained. Because of these facts, we stepped backward, so far as fuel saving is concerned, and now install steam machinery, because it costs too much to save fuel with gas engines.

In our steel plants and factories, numberless steam engines, pumps, turbines, and boilers are operating at pressures ranging between 100 and 200 pounds per square inch. Most of the owners know that a great deal of fuel could be saved, if the old equipment were removed and if new equipment designed for a pressure of 400 lb. per sq. in. were installed, but the cost of making the change would be very great in comparison with the money saved; therefore the change is not made. But worse than this, new boilers and new prime movers are added from time to time, and are operated at the same old low pressure, because the new boilers send their steam into the old system of pipes.

A very glaring example of the high cost of fuel saving is furnished by the electrification of our railroads. Fuel can indeed be saved by electrification, but the cost is so enormous that electrification has been limited to suburban and terminal traffic.

Let us turn to another example. In forges and rolling mills it was customary 25 years ago to send the waste gases from heating furnaces through waste heat boilers. But one by one, these waste heat boilers have disappeared. In their place we find coal-fired boilers in a central boiler house, and we allow the hot products of combustion from the heating furnaces to go to waste. We burn more fuel by the modern method, but we save labor by the concentration of the many scattered boilers into one or two centrally located and easily supervised boilers. It costs too much to save fuel.

In open hearth practice waste-heat boilers have been "coming in," because the heat quantities are so large and so dependable with regard to time that the saving by their use is obvious. However, their adoption is by no means universal. In districts of cheap fuel their introduction is very slow, because the saving in dollars is small compared with the installation cost, and because floor space is at a premium.

Large Losses in Steel and Glass Plants

Steel plants are great wasters of fuel. Products of combustion leave the reheating furnaces at temperatures as high as 2400 deg. fahr., and few attempts are made to salvage the enormous quantities of heat. The reason is plain. It costs too much to save this heat. It can be salvaged by waste-heat boilers, regeneration, or by recuperation, or finally by substituting sufficiently large continuous furnaces for those that are too small. Waste-heat boilers have been discussed. Regenerators and recuperators are expensive, require space and maintenance, and occasionally lead to interruption of operation. For the sake of reliability and simplicity they are often dispensed with, and fuel economy steps into the background. Matters are even worse. if the steel plant is located in a district in which natural gas is cheap. In that case, there is but little incentive to save by-product coke-oven gas. It must be used within the works, because it has no value outside.

Our open-hearth furnaces, glass-melting furnaces and similar high-temperature furnaces waste enormous quantities of heat by radiation, which could be saved by insulation; but the cost of saving this heat is at present prohibitive. The refractory materials now available at reasonable cost are viscous at furnace temperatures; that is to say, they flow or slough off. In order to preserve the furnace structure, we must reduce the thickness of the semi-fluid hot layer as much as possible and provide adjacent to it cooler and solid layers, which can be accomplished only by allowing a lively flow of heat from the furnace interior through the walls. The quantities of fuel wasted in this manner are enormous. In open-hearth furnace practice we use a quarter of a pound of coal to make a pound of steel. Some of the processes require no heat, while others require not more than 1/12 lb. of coal per ton of steel for the reactions; the rest is wasted on account of the use of imperfect refractories. The efficiency of glass-melting furnaces is about 6 per cent; the rest of the heat is wasted on account of imperfect refractories. If fuel were dearer, research for perfecting refractory materials, and the incentive for using more expensive refractories, would be stimulated; or if the right refractory material could not be found, the low-temperature heat given off by the walls would be utilized.

The large radiation loss, or wall loss, of high temperature furnaces entails a high flue-gas loss, because so much fuel must be burned in order to furnish the heat lost through the walls. A large part of this heat can be recovered by waste-heat boilers, and is so recovered in an ever-growing number of works in connection with those furnaces which furnish a large, steady uninterrupted flow of heat. But these waste-heat boilers are, as a rule, located in regions of expensive fuel. In districts enjoying inexpensive fuel, however, their introduction has been painfully slow or wholly absent, because they pay small dividends on the investment. Not only must boilers, forced draft equipment, and flues be installed, but the furnace regenerators must be made tight against air infiltration and must be kept tight. And, as before stated, it costs too much to do all this.

In steel works, glass works, and the like, fuel can be saved by working with complete combustion with minimum excess air, or where a reducing flame is necessary, with the minimum possible amount of consumed combustible in the flue gases. Doing so requires instruments, and instrument men who keep them in repair, change charts, compute results, etc. These men are frequently considered non-productive and are discharged at the first approach of hard times, perhaps never to be hired again. In districts of cheap fuel, discarded CO_2 recorders of every description stand around in dark corners. It costs too much to use them. Municipal pumping plants, power plants of hospitals and schools, and many other fuel-consuming plants, know only one instrument; namely, the steam gage. All others are out of use.

Save Man Power—Neglect Fuel Losses

The great cry is apparently not to save fuel, but to save man power, to increase production per man, except in those processes in which the cost of fuel is so great that it completely overshadows wages and salaries.

The examples of the high cost of fuel saving could be multiplied without much effort. Once having recognized the underlying principle, it may be seen sticking out from many transactions of business and private life.

The question is: What can be done about the situation? As long as the present economic situation continues, as long as the present formula for judging the financial returns of a fuel-saving installation is taught in the technical schools and is lived up to in practice, just so long will fuel be wasted; it costs too much to save it.

All of this would be changed as if it were touched by a magic wand, if fuel suddenly became scarce and expensive. If that change occurred, the fuel engineer, who is now the "fifth wheel" on the wagon in many industries, would suddenly rise into prominence and become an important personality.

The miners' union, it is often said, are doing their best to make fuel both scarce and dear; but their efforts do not help the nation, because they are selfish and not constructive. Further, they do not directly affect the cost of natural gas or oil. On the other hand, our government, whether it be state or federal, could levy a high tax on fuel. Such a suggestion was made by the author in 1918 (See *Blast Furnace and Steel Plant*, and *Literary Digest*). The thought expressed at that time was that the tax on fuel would create an income and a surplus out of which the government could pay a large part of the cost of fuel-saving equipment, because it would, on account of the government subsidy, cost but very little more than the fuel-wasting equipment, and would very greatly reduce the cost of operation, as a result of the high cost of fuel. Furthermore, the plan would furnish a strong inducement to save fuel by careful operation, and instruments as well as fuel engineers would become indispensable. It is immediately evident that the execution of such a plan would call for standardization of the fuel consumption of different types of equipment for the purpose of determining the government subsidy to be paid in each case, but engineering societies would doubtless assist in this work and would put it on a sound basis, reasonably free from politics or graft.

Let it be emphasized again. If fuel is to be saved, if the fuel engineer is to amount to anything while it is so easy to extract fuel from the earth, fuel must be made dear artificially. Evidently the only motive of such a step would be thoughtfulness for posterity. The question may well be asked: what has posterity done for us? But a wise government must look ahead into the future and do like the farmer who plants fruit trees when he knows well that they will not bear fruit while he is among the living.

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ESTABLISHED 1920

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A Generation Passes

One by one the generation which has made the American glass industry great is being laid to rest. Michael J. Owens, Edward D. Libbey have gone to their reward. In the month of March death has taken away two more great leaders of the glass industry: Charles W. Brown, president of the Pittsburgh Plate Glass Company, and W. A. B. Dalzell, president of the Fostoria Glass Company. Their parting leaves voids in the industrial fabric of the country that never can be filled.

A great generation of glass makers is passing away. Never before in the history of the glass industry, stretching out into far away antiquity has a single generation been confronted with a challenge like these men were called upon to face. Twenty-five years ago, in the fullness of their lives they saw the need of completely changing the traditional methods of their industry, grown venerable through age. Until 1900 there was little of machinery used in the glass industry. Mechanical equipment, which years before the passing of the 19th century had revolutionized industries, had stopped short when it came to handling that most elusive of all materials, molten glass, which would yield itself to none but the trained craftsman.

They achieved the impossible: to make machines do the work of men. To the great pioneers of the glass industry who gave without stint of their skill, their intellect, their goods, their lives, all that they had and were, to those men the American glass industry owes the magnificent position which it occupies in the world today.

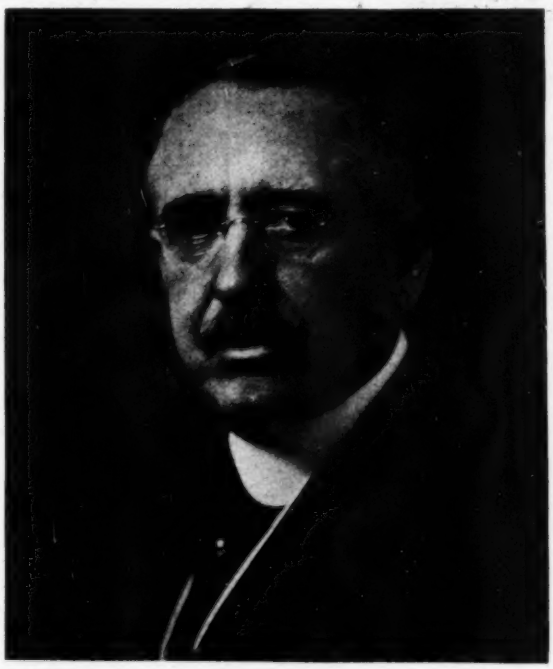
As we pause a while in respect for those who have gone it is fitting to express the confidence that those traits, which have characterized these leaders, have not been withheld from the younger generation, to whom they will always remain an example and an inspiration. Great deeds spring from great thoughts. However different these men were, in whatever different branches of the glass industry they were active, they all had in common those fundamental marks of character: faith, courage, energy, steadfastness of purpose, without which even genius is but of little avail.

They leave to the present generation great material gains. But we shall never possess the full measure of their heritage until we shall have mastered those traits of character that have made possible what they have achieved. Of each of them it can be said:

"He was a man,
Take him for all in all,
We shall not look upon his like again."

Report on Fluorspar Industry

FLUORSPAR, ITS MINING, MILLING AND UTILIZATION, with a chapter on Cryolite, by Raymond B. Ladoo. Bureau of Mines Bulletin 244. A 190-page paper-covered volume. Price 35 cents. For sale by the Superintendent of Documents, Government Printing Office, Washington. The author visited nearly all of the important fluorspar mines and mills in the United States and has endeavored to correlate the scattered material obtained and to study the industry as a whole. His field work was done in 1921, 1922 and 1923. Conditions in the industry have altered a little since that time, but the changes do not alter materially the conclusions reached.



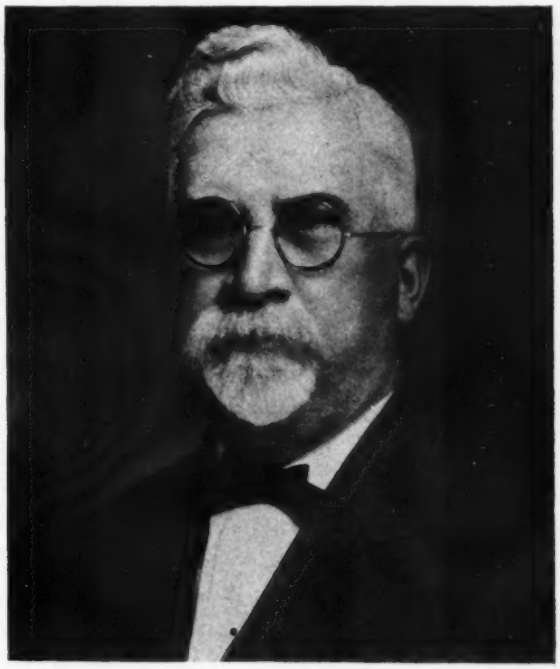
CHARLES W. BROWN
Died March 6, 1928

On Tuesday, March 6th, Charles W. Brown, President of the Pittsburgh Plate Glass Company passed away at his home in Sewickley, Pa. Captain Brown, as he was affectionately known to his many friends, had been confined to his bed following a stroke of apoplexy which he suffered on January 14.

Charles W. Brown was born in Newburyport, Mass., on July 14th, 1858, and was of New England ancestry. He was educated in his native city public schools and Dummer Academy, South Byfield, Mass. At the age of seventeen he went to sea, which he followed until 1885, during which time he was Captain of a vessel engaged chiefly in the Australian and China trade.

Retiring from the sea Mr. Brown went to Minneapolis, Minn., and entered the glass manufacturing and jobbing business. In 1898 he moved to Pittsburgh, Pa., and became secretary of the Pittsburgh Plate Glass Company. He was made vice-president in 1905, and has been president and director of that Company since 1916. He was Chairman of the Board of the Pittsburgh Branch of the Federal Reserve Bank of Cleveland, a director in the Mellon National Bank, and occupied other important posts.

Surviving Captain Brown is his wife, Alice G. Brown, three sons, Jacob B. and Harold of Akron, Ohio, and Charles W. Brown, Jr., of Boston, Mass., and three daughters.



W. A. B. DALZELL
Died March 12, 1928

On Monday, March 12th, W. A. B. Dalzell, President for many years of the Fostoria Glass Company of Moundsville, West Virginia, passed away, from an attack of heart disease.

Although he had reached 70 years of age, Mr. Dalzell had remained in touch with the activities of his company until recently. He entered the glass trade at Pittsburgh in 1878 and later became interested at different times in plants operated in West Virginia and Ohio. For years he was active in the firm of Dalzell, Gilmore and Leighton, at Findlay, Ohio, whose plant was sold to the National Glass Company in 1899. In 1901 Mr. Dalzell resigned from the management of that company and became connected with the Fostoria Glass Company at Moundsville, as vice-president, and before long was elected president.

Mr. Dalzell was for many years prominent in the affairs of the American Association of Flint and Lime Glass Manufacturers. In 1923 he was elected president of the organization, succeeding Marshall W. Gleason. He was also active in other organizations such as the American Manufacturers Association and the National Chamber of Commerce.

He is survived by his wife and two sons, W. F. Dalzell, general manager of the Fostoria Glass Company and Harry G. Dalzell, manager of the company's Chicago office.

Correspondence

Further Criticism

To the Editor of THE GLASS INDUSTRY:

Mr. McSwiney's criticism of the article on furnace construction in your January number meets my own opinions so closely that it leaves little room for further comment by me.

The outstanding blunder in the article under consideration is, of course, the assumption that the combustion gases "cool to the point where they start absorbing heat." This implies a violation of a law of thermodynamics. Energy does not flow from lower to higher potentials.

Means of temperature measurement are not stated. It would be interesting to know how the writer arrives at 2730 deg. F., as the temperature of combustion, and 2400 deg. F., as the temperature of the waste gases. I would imagine that the actual determination of either of these temperatures would be a difficult problem in physical measurement.

And yet, the "heat balance" given is based on these figures. The "unaccounted for losses" come out 15,796,372 B. t. u. per hour. These, it is said, must be laid to the "absorption of heat by the chilled gases of combustion and the incoming cold air." Putting aside the absurdity "chilled gases of combustion," let us consider how much air must leak into a furnace to absorb this quantity of heat. Without going into arithmetical detail unwarranted by the data it appears from the table cited that the air for combustion, at 1832 deg. F., brings into the furnace from the regenerator about twice the quantity of heat mentioned as "accounted for losses." If this much air rose to 2400 deg. F., it would contain as sensible heat about 30 per cent more or 2.6 times the "lost" heat. Therefore a volume of air 1/2.6 or .38 the volume of the air for combustion, leaking into the furnace, would cool its atmosphere to the assumed degree. This would seem to require a combination of leaks and drafts outside all experience.

Columbus, Ohio S. R. SCHOLES
March 24, 1928.

Abolish Use of Word "Demi-plate"

A Trade Practice Conference of the heavy plate glass industry was held at the office of the Federal Trade Commission, 45 Broadway, New York on March 22. William E. Humphrey, chairman of the Federal Trade Commission was present and M. Markham Flannery appeared on behalf of the Federal Trade Commission.

Others present were: George Osgood Andrews, New York, eastern representative of the Plate Glass Manufacturers of America; W. S. Wilcox, Libbey-Owens Sheet Glass Company; Mario Mazzarovich, Vitrea Glass Works, Ltd.; Carl F. Doerr, secretary of the Eastern Division of the National Glass Distributors Association; A. Solomon, president, L. Solomon & Son, Inc., importers; and J. K. Wilson, Merchandise Department, National Better Business Bureau.

The meeting was called to consider the question of misbranding plate glass.

Col. Andrews opened the discussion by stating that the glass in question, which has been known as "demi-plate" glass is an imported article which was brought to this country some two or three years ago and has been sold on many occasions as a substitute for polished plate glass. The name is a misnomer. There is nothing plate about it. It serves as a deception of the public and the innocent buyer is misled into supposing that the glass has the merits and the qualities of polished plate glass. It is nothing more or less than heavy window glass, having all of the characteristics of window glass and none of the characteristics of plate glass, as set forth in the specifications of the Bureau of Standards.

Concrete evidence of this has been placed in the hands of the Director of the Federal Trade Commission, Trade Practice Conferences, showing conclusively that fraudulent practices have taken place in the matter of substitution of "demi-plate" glass for "plate glass." The proper name of this glass is "Vitrea" and it is sold under that name by the manufacturers in Europe. "Demi-plate" is a coined word which must have been conceived for fraudulent purposes. It has worked hardship on the plate glass manufacturers because of the deception; it has also worked a hardship on the manufacturers of heavy sheet glass, for the reason that people, supposing they could buy something that was plate, when they were buying that which was window.

In view of this fact he offered the following resolution which has the endorsement of the Plate Glass Manufacturers Association and was endorsed unanimously at a meeting on March 21 of the Eastern Division of the National Glass Distributors of the United States:

> WHEREAS, the use of the phrase "Demi-Plate" in describing ordinary drawn window glass has been shown by investigation to have the capacity and tendency to mislead the public into the belief that the glass thus described is a form of plate glass, and
>
> WHEREAS, numerous efforts have been made by the industry to eliminate this term from the trade, which every now and then reappears,
>
> It seems that in numerous instances purchasers of glass for doors, windows, store fronts, show cases, desk tops, automobile wind shields, replacements, etc., have been supplied with a heavy window glass instead of the polished plate glass which in such instances was specified. The difference between the two materials is clearly set out by the Bureau of Standards in the United States Government Master specifications for flat glass for glazing purposes.
>
> RESOLVED: That on and after this date the words PLATE GLASS shall apply only to such flat glass as may have been ground and polished in accordance with the definitions and descriptions for Plate Glass as set forth by the U. S. Government Specification Board on April 1, 1924, entitled: "Federal Specification Board Specifications No. 123" and be it further
>
> RESOLVED: That on and after this date the use of the words PLATE GLASS or of any words, prefixes or suffixes, in connection or in conjunction with the words Plate Glass shall not be used in any manner whatsoever in the advertising, sale, distribution or manufacturing of any window glass which has not been ground and polished in accordance with the said Federal Specification Board Specifications No. 123."

In explanation of that, Colonel Andrews stated that plate glass would be window glass were it not ground and polished. The ingredients entering into the manufacture of plate and window glass are very similar. The mere fact of grinding and polishing it, converts that which would be window glass into plate glass.

Commissioner Humphrey inquired whether there were any present opposed to the resolution or had any suggestions to make in regard to changes.

Mr. Solomon replied that he did not oppose the resolution but desired to make a few corrections. He said that the words "demi-plate" had not been used as a term, to his knowledge, for at least two years, perhaps longer. He stated that he did not believe that at any time any distributor had ever intended to mislead the public by the use of this name.

The Commissioner then said that as he understood it, Mr. Solomon had no objection to the resolution except that he thought it unnecessary.

Mr. Solomon stated that the use of the term "demi-plate" was not necessary to sell the product and that for the past two and a half years that particular glass had been called Vitrea glass.

Colonel Andrews then produced a copy of a letter dated February 8, 1927 from a very large distributor of Brooklyn in which he solicits orders for "demi-plate" glass, mentioning the name. So the term was used within a very few months. As stated recently the Director of the Trade Practice Conferences has concrete evidence, receipted bills, where the glass has been specified.

"We don't know what may happen in time to come, and we are anxious to have this matter settled for all time that 'plate glass' would mean exactly what the Bureau of Standards call it."

The Commissioner then put the question as to whether there was anyone present opposed to the adoption of the resolution. No objection was registered.

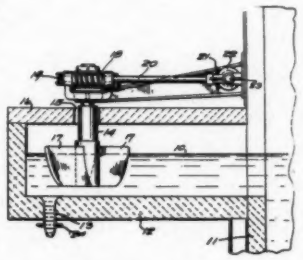
The resolution has been referred to the Federal Trade Commission at Washington and it is expected that the Commission will issue a ruling putting the resolution into effect at an early date.

Recent Patents

NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

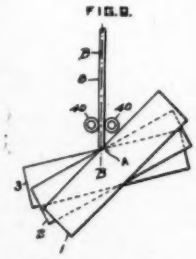
Complete copies of U. S. Patent Specifications may be obtained from the Commissioner of Patents, Washington D. C. Price 10c each

GLASS FEEDER. U. S. 1,660,429. Feb. 28, 1928. Leonard D. Soubier, Toledo, O., assignor to the Owens Bottle Co. Filed 7/5/23. The blades 17 as they rotate are moved alternately over the outlet. Each blade as it approaches said outlet, exerts an expelling force on the glass flowing through the outlet, thereby accelerating the flow. As the blade passes beyond the outlet, it exerts a retarding force or upward pull on the glass in said outlet, thereby temporarily retarding the flow. A pair of shears 24 operates in synchronism with the movements of the propeller blades to periodically sever the issuing glass.



APPARATUS FOR THE CONTINUOUS GRINDING AND POLISHING OF GLASS IN THE FORM OF STRIPS OR PLATES. U. S. 1,661,914. Mar. 6, 1928. Robert Francis Taylor, St. Helens, England, assignor to Pilkington Bros., Ltd. Filed 4/17/24. In continuous grinding and polishing apparatus, a series of tables one end surface of each of which abuts against the adjacent end surface of the next adjacent table, a ridge on one such abutting end surface, a recess in the other of said abutting end surfaces, the ridge and recess being in mutual engagement to prevent relative motion between said end surfaces in either direction perpendicular to the plane of the supporting surface of said tables, and means for retaining the end surfaces in abutment.

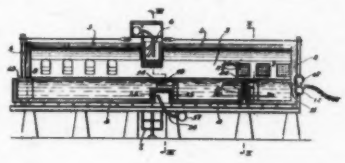
MACHINE FOR ROUNDING THE EDGES OF SHEETS OF MATERIAL. U. S. 1,660,350. Feb. 28, 1928. William Owen, Pittsburgh, Pa., assignor to Pittsburgh Plate Glass Co. Filed 4/8/26. The machine comprises a roughing unit having six surfacing wheels and a finishing unit having four surfacing wheels. The pairs of roughing wheels practically shape the edge of the sheet as they are placed at different angles and, therefore, grind a plurality of bevels which merge into each other. The edge is, of course, still unfinished after passing these wheels, but the major portion of the work is accomplished, and what remains is finished by the first two finishing wheels, which are circumferentially grooved to the exact contour which it is desired to give the edges of the glass sheets. The final wheels are preferably polishing wheels.



APPARATUS FOR SEVERING GLASS SHEETS. U. S. 1,661,846. Mar. 6, 1928. Travis Oakes and Alfred C. Oakes, Mt. Vernon, O., assignors to Pittsburgh Plate Glass Co. Filed 3/18/26. Apparatus for automatically severing or separating glass sheets from a continuously formed ribbon. The heated ribbons for severing the glass sheets from the continuously formed ribbon are controlled by switches operated by hand, and the air chilling means for starting the crack along the line of heating is controlled by a foot valve, as the operator holds the sheet with both hands to prevent it from falling to the floor, while the severing operation is performed.

LEHR-CONVEYER MECHANISM. U. S. 1,660,463. Feb. 28, 1928. Percy Q. Williams, Cincinnati, O. Filed 4/25/23. The combination with a lehr having an opening at one end, of a conveyer located exteriorly of the lehr and extending in substantial alignment with the lehr, means for imparting an angular movement to the conveyer and moving the discharge end thereof laterally of the lehr opening, and means for simultaneously imparting an endwise movement to the conveyer, whereby the discharge end thereof is caused to move in a substantially straight line across the lehr and is maintained at a constant distance from the lehr opening.

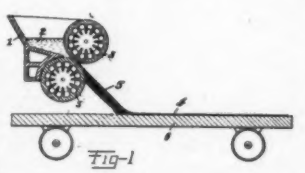
GLASS-MELTING TANK. U. S. 1,661,836. March 6, 1928. Karl G. Kutchka, Wilkinsburg, and Thomas H. Swartzlander, Aspinwall, Pa., assignors to Pittsburgh Plate Glass Co. Filed 3/18/26. A tank construction in which the flow of the body or stream of glass is widened and increased in cross section, so that the velocity of flow is reduced and gives a longer period of melting and fining, and in which the temperature of the glass in the working end of the tank along the side walls is increased to provide a greater flow in such portions of the tank incident to the greater fluidity of the glass at such points. A melting end provided with heating means, a working end having a withdrawing opening, an arched bridge wall lying below the surface of the glass intermediate the melting end and the working end, a second arched bridge wall lying below the surface of the glass intermediate the first bridge wall and the forward end of the tank, and a refractory floater in the glass above each bridge wall and extending transversely across the tank.

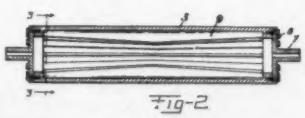


GLASS-FEEDING APPARATUS. U. S. 1,660,415. Feb. 28, 1928. Albert N. Cramer, Toledo, O., assignor to Owens Bottle Co. Filed 9/4/23. In the practical operation of a feeder of the plunger type, it is frequently necessary to adjust the length of stroke of the regulator or its height in order to regulate the size and shape of the issuing charges or gobs. A feature of the present invention consists in providing a simple and practical means for shifting the fulcrum of the operating lever while the feeder is in operation.

CUTTING TABLE. U. S. 1,660,327. Feb. 28, 1928. Albert E. Evans, Pittsburgh, Pa., assignor to Pittsburgh Plate Glass Co. Filed 6/9/26. In combination with a cutting table, a plurality of rollers with horizontal axes of rotation distributed over the area of the table and projecting above the surface thereof, vertical axles or spindles carrying said rollers and adapted to be turned through an angle of ninety degrees, means for turning said axles, stop means for limiting the rotative movement of the vertical axles or spindles, and yielding means for moving said axles or spindles to such extremes of rotative movement and maintaining them in such positions.

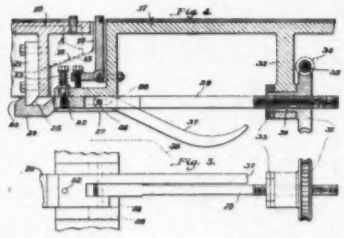
ROLL FOR ROLLING MOLTEN GLASS. U. S. 1,659,053. Feb. 14, 1928. Harold R. Schutz, Toledo, O., assignor to the Edward Ford Plate Glass Co. Filed 3/3/27. Relates to the manufacture of plate or sheet glass, by the intermittent, as distinguished from the continuous, rolling method. When rolls of ordinary character are at rest the prolonged contact of the molten glass with the portion of the rolls exposed to the receptacle causes a more rapid expansion of such portions than others of the rolls, resulting in a hump or bulge at such points, and alternately thin and thick sections are produced in the sheet. This invention provides a hollow roll having a relatively thin wall or shell to effect a rapid dissipation of heat therethrough to the interior cooing means and also provides the interior of said wall





with a plurality of ribs or fins both to increase the heat radiating efficiency of the inner surface of the roll and to strengthen or reinforce the thin wall against compressing or deflecting forces.

APPARATUS FOR SURFACING SHEETS. U. S. 1,660,330. Feb. 28, 1928. John H. Fox, Pittsburgh, Pa., assignor to Pittsburgh Plate Glass Co. Filed 3/18/22. A surfacing train comprising a series of cars for carrying glass sheets to be surfaced, each of which has one end slightly lower than the other end, overlapping inclined surfaces on adjacent cars at their abutting ends, coupling means for pulling the cars together so that the inclined surfaces co-act to lift the low end of the one car to bring the top surface to the level of the top surface of the high end of the next car and so that a part of the weight of the car having the low end is borne by said next car, and means for releasing the coupling means to permit the cars to separate.

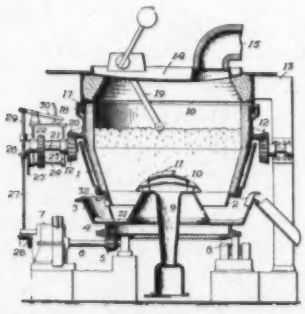


FURNACE FOR ANNEALING AND FLATTENING GLASS. U. S. 1,660,157. Feb. 21, 1927. Joseph J. Gesner, Okmulgee, Okla. Assignor of one-third to Thomas Waters, one-third to Lula M. Gessner and one-third to John R. Scohy, all of Okmulgee, Okla. Filed 12/6/26. An improved flattening oven within which split cylinders of glass may be more accurately and completely flattened than has heretofore been customary.

METHOD AND APPARATUS FOR FORMING GLASSWARE. U. S. 1,660,125. Feb. 21, 1928. Orin A. Hanford, Columbus, O., assignor to the Federal Glass Co. Filed 12/6/22. This device is claimed to be particularly applicable to blown ware being highly desirable in the making of blown tumblers and similar thin ware such as electric light bulbs.

Twenty-three pages of text and 87 figures describe the invention the aim of which is the provision of an entirely novel method of getting the charge to the forming apparatus coupled with a number of novel methods of manipulation and coupled with many novel combinations and subcombinations of apparatus for producing the blown articles and delivering them from the machine. In its preferred form, the apparatus contemplates the provision of a plurality of identical ware forming units arranged immovably and in series.

GAS PRODUCER. U. S. 1,659,493. Feb. 14, 1928. Charles W. Lummis, Worcester, Mass., assignor to Morgan Construction Co. Filed 4/19/19. Relates to gas producers, and more particularly to those wherein are employed mechanical devices for procuring continuous agitation of the fuel bed during the gas making operation, and for removing ashes from the producer. The inventor claimed rotatable producer body, a rotatable ash pan in water sealing relation to the bottom of said body, said producer body and pan being relatively rotatable, and the pan having a central portion through which a blast is adapted to be delivered, the pan and body being supported substantially coaxially but wholly independently of each other.

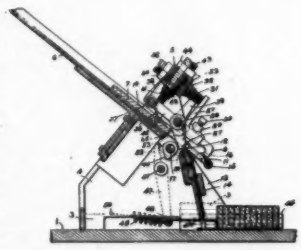


APPARATUS FOR AND METHOD OF FEEDING MOLTEN GLASS. U. S. 1,662,436. March 13, 1928. Karl E. Peiler, West Hartford, Conn., assignor to Hartford-Empire Co. Filed 7/17/20. The combination of a molten glass container having a submerged outlet, means to periodically apply pneumatic pressure on the surface of the glass to exert an extruding force thereon, means to periodically reduce the pressure on the surface of the glass to a point below atmospheric pressure to exert an intruding force on the glass at the outlet, means for periodically exposing the surface of the glass to atmospheric pressure for a definite period of time whereby glass is extruded by the action of gravity alone, and means operating in timed relation with said pressure applying means to periodically sever the glass adjacent to the outlet.

APPARATUS FOR FEEDING MOLTEN GLASS. U. S. 1,662,437. March 13, 1928. Karl E. Peiler, West Hartford, Conn., assignor to Hartford-Empire Co. Filed 7/28/20. The combination with apparatus for separating molten glass into mold charges, of a glass container having a submerged outlet, a pump for supplying abnormal air pressure to the surface of the glass to control its movement in the outlet, and means independent of the pump for variably regulating the air pressure.

PROCESS OF MAKING DECORATED GLASSWARE. U. S. 1,662,295. Mar. 13, 1928. Martin L. Burgess, Indianapolis, Ind., assignor to Marietta Mfg. Co. Filed 3/8/26. The process of producing a two-tone color effect in glassware, which consists in subjecting a plate of glass of uniform color throughout and while hot to a roll having a pattern surface etched thereon.

GLASS-SNAPPING MACHINE. U. S. 1,660,323. Feb. 28, 1928. Christopher Brown, Charleroi, Pa., assignor to Pittsburgh Plate Glass Co. Filed 1/2/25. In combination in a machine for snapping transversely scored glass strips, an inclined guideway for receiving the glass strip having its bottom surface convex, a snapping edge adjacent the end of the guideway, a stop for engaging the end of the strip positioned in advance of the snapping edge, a hammer for striking the strip in advance of said snapping edge, and automatic means for causing the hammer to strike at timed intervals.



GLASS-SEVERING METHODS AND APPARATUS THEREFOR. U. S. 1,659,590. Feb. 21, 1928. Carl A. Brown and Andreas C. Nielson, Cleveland, O., assignors to General Electric Co. Filed 7/23/23. Apparatus for severing blown glass articles such as bulbs from the tubing or the surplus neck portion to which they are attached.

NON-GLARE MIRROR. U. S. 1,662,565. March 13, 1928. George Fielding Colbert and William Harry Colbert, Pittsburgh, Pa. Filed 5/3/27. The herein described operation of producing a light absorbing non-glare mirror, which consists in subjecting one surface of a glass sheet to a treatment adapted to remove all grease and other foreign matter therefrom, and then exposing the said treated surface to the action of a mixed solution of a metallic salt, an alkali thiourea, and ethyl alcohol, to thereby deposit thereon a dense uniform lustrous coat of metallic sulphide.

LENS-GRINDING MACHINE. U. S. 1,662,157. Albert E. Maynard, Southbridge, Mass., assignor to American Optical Co. Filed 2/14/25.

METHOD OF AND APPARATUS FOR PRODUCING MOLTEN GLASS. U. S. 1,662,116. Mar. 13, 1928. Charles B. Kingsley, Clairton, Pa., assignor to Mississippi Glass Co. Filed 3/5/27. The method of operating a glass melting apparatus comprising confining molten glass within tank walls, laying a new course of block under a wall section, and raising the new and old portions of said section to displace the top course of the old section in said side wall.

GLASS-FORMING MACHINE. U. S. 1,662,848. March 20, 1928. Albert N. Cramer, Toledo, O., assignor to the Owens Bottle Co. Filed 5/21/23. In a glass forming machine, the combination of a mold open at its upper end to receive a charge of glass, a guide normally arranged to direct the charge into the mold, a mold closing head adjacent one side of the mold, means to move said head into and out of position to close the upper end of said mold, and connections between said head and guide actuated by a movement of the head for moving the guide relatively to the head in a direction transverse to that of the head, into position to prevent interference with movement of the head.

Glass Factory Equipment and Supplies

Most of the information printed in this department comes direct from the manufacturers of the products described.

Makes Glass Working Machinery of Many Types

The Eisler Engineering Company, 740-772 South 13th Street, Newark, N. J., has recently issued a "Catalog N" devoted exclusively to Eisler glass working machines, including equipment for Neon sign tube manufacturers for which a special department is maintained. The company also manufactures a complete line of machinery for making radio tubes.

Over 250 types of machines used in the glass working indusrty are included in their line. Listed in the catalog are burners for artificial gas, natural gas or oxygen, tubular burners, blast burners, gas, air and oxygen torches, oxygen crossfires. An electric welder for rapid production of metal parts used in connection with glass products is one of the specialties listed. Also automatic and hand-operated flare making machines, automatic stem making machinery with six, seven and eight heads are produced, twelve types of sealing machines for bulbs, special automatic machinery for long tubes, and high vacuum pumps of various types are made. Air pressure blowers, gas boosters and regulators of various types are designed and built. Complete equipment is furnished for making Neon signs, including high Frequency apparatus such as bombarders for heating the elements of the tube. Special machinery for glass working is designed and built, including a bulb blowing machine for bulbs less than 2 inches outside diameter, also butt sealing, flanging, ampule molding and constriction machines, tabulating machines and hydrometer molding machines.

The company's plant and organization in Newark, N. J., is stated to be the largest and best equipped for the manufacture of the products listed above and others of similar character. Copies of the "Catalog N" may be obtained by request.

Big Building Year Indicated in Ohio

As an index to current conditions in the building trade in one important section of the country, the Cleveland, Ohio, territory, a recent report of The Austin Company, well known national builders, with headquarters in that city, is of interest.

More than a dozen of the one hundred building projects which this firm has under way from Coast to Coast are located in Greater Cleveland alone. Included among them are a number of large industrial plants, a large motor bus garage and several service stations, a hangar for the Ohio National Guard, and other structures.

The year just passed was the most successful in the Austin Company's history, but this year's business is starting with such volume that 1928 bids fair to be even better. The sales volume for January and February of this year was far ahead of that of the same period last year.

The Austin Company is expanding its own facilities to meet this greatly increased demand. At its main office, corner of Euclid and Noble Road, ground was broken recently for a large two-story and basement addition to the office building. Greater facilities for the Engineering Department and general office use are being provided at a cost of well over $50,000.

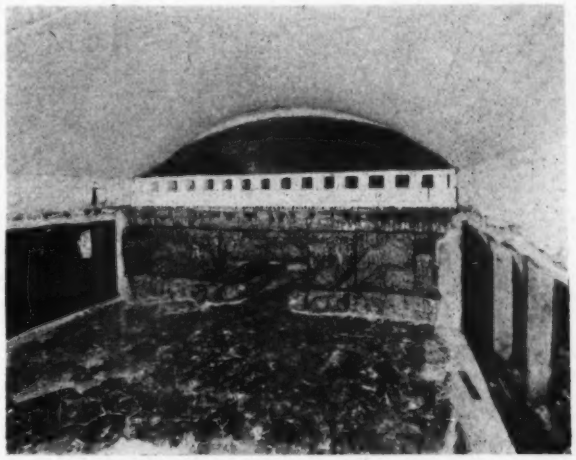
At Bliss Mill, Austin's steel fabricating plant, in Euclid, Ohio, provision is being made now for the construction of an entire new woodworking shop to replace the cramped quarters at its present location. This move will result in the mobilization of all Austin service facilities at Bliss Mill, where the steel fabricating plant has been located for several years. Austin is the largest fabricator of structural building steel in the Cleveland territory, shipping steel to all parts of the United States and to such distant points as Constantinople and Cape Town, South Africa.

Will Manufacture Corning Cast Tank Blocks in France

Arrangements have been made by which the Saint Gobain Plate Glass Works (Société Anonyme des Manufactures des Glaces et Produits Chimiques de St. Gobain, Chauny et Cirey) will undertake to manufacture cast refractories developed by the Corning Glass Works, jointly with the latter company, to supply the European market for the new refractory material.

Bridge Wall at Pittsburgh in Long Run

The illustrations herewith show both sides of the bridge wall of a 14 by 24-foot tank at the plant of the J. T. & A. Hamilton Company, bottle manufacturers, Pittsburgh, Pa. This tank was put into operation on May 8, 1926, and ran continuously until



BRIDGE WALL SEEN FROM MELTING END OF TANK AFTER REMOVAL OF SIDE WALL BLOCKS.

February 22, 1928, a period of 21½ months. So far as the bridge wall is concerned the tank might have been operated for a still longer period, but it was decided to make repairs and these photographs were taken to show the excellent condition of the bridge wall at the time the tank was emptied.

The wall was built by the H. L. Dixon Company, Pittsburgh,

BRIDGE WALL SEEN FROM REFINING END OF TANK, SHOWING EXCELLENT CONDITION OF REFRACTORIES.

from material made by the Pittsburgh Clay Pot Company. The composition of the block used in the construction of the wall has not been made known, but the photographs give evidence of the highly resistant character of the product.

The Glass World and What It Is Doing

News of the Industry

Pittsburgh Plate Glass 1927 Profits Declined

The decline in profits earned in 1927 as shown by the Pittsburgh Plate Glass Company annual report is attributed to the falling off in consumption and lower prices. Gross earnings were $11,667,755. Adding unused reserve for taxes for 1926, $93,413, and deducting for depreciation, obsolescence and depletion amounting to $4,362,400, and reserve for taxes amounting to $875,000 leaves a net profit of $6,523,768 as compared with a net profit for the year 1926 of $10,016,947.

Nearly $5,000,000 was spent in additions and improvements, including further development of the Creighton plate glass plant and installation of a new process at Ford City. Reconstruction of the window glass plant at Clarksburg, new sand fleet on the Allegheny River and various other extensions and improvements were included.

The Creighton plant is now the largest and most modern producing unit in this country. After long experimentation a new casting process has been developed, patented and placed in successful operation in the Ford City plant. An appropriation of $5,500,000 has been made for the installation of continuous grinding and polishing machinery at this plant, especially designed to produce wide ranges of sizes and qualities.

A melting tank and annealing lehr with complete equipment for experimental purposes have been built at the Creighton plant.

The Pittsburgh Safety Glass Company, as previously announced, has been organized for $1,000,000, half of which is owned by the Du Pont Viscoloid Company.

The domestic production of plate glass in 1927 was 116,000,000 square feet and the consumption was approximately 125,000,000 square feet. The productive capacity of the country exceeds 150,000,000 square feet and this situation brought about a reduction in prices.

The Ceramic Tour

About one hundred persons connected with the various branches of the ceramic industry have already signified their intention of joining the party which will make a tour of Europe from May 19 to July 5, 1928, including visits to England, Germany, Czechoslovakia, France and Holland. This will be the first Trans-Atlantic tour of the American Society. Plans have been made on a large scale by foreign ceramists for the entertainment and instruction of the American party. It is hoped that all of the Divisions of the Society will be well represented. Among those who have already reserved cabins, the following have been reported:

Mr. and Mrs. D. A. Cable.....Canton, Ohio
Mr. and Mrs. F. W. Moffat..Weston, Ontario, Canada
T. A. Wilson.....Reading, Penna.
E. L. Hettinger.....Reading, Penna.
Prof. Alexander Silverman.....Pittsburgh, Penna.
Richard Scott Moore.....Chicago, Illinois
Mr. and Mrs. F. E. Hodek, Jr.....Chicago, Illinois
Mr. and Mrs. J. A. Dedouch.....Oak Park, Illinois
Alice Dedouch .....Oak Park, Illinois
Charles B. Garwood .....Baltimore, Maryland
William Garwood.....Baltimore, Maryland
Carl G. Hilgenberg.....Baltimore, Maryland
William H. Crume.....Dayton, Ohio
Mr. and Mrs. B. Mifflin Hood.....Atlanta, Georgia
Carroll and Betty Hood.....Atlanta, Georgia
Carl H. Zwerman.....Robinson, Illinois
Arthur J. Bennett.....Trenton, New Jersey
R. E. Elliot .....St. Johns, Quebec, Canada
George Simcoe.....Trenton, New Jersey
M. C. Booze .....Cincinnati, Ohio
Ross C. Purdy.....Columbus, Ohio
Mr. and Mrs. William L. Phillips.....Alameda, Calif.
Mr. and Mrs. Arthur J. Podmore, Camden, New Jersey
Frederick Sutterlin .....Trenton, New Jersey
Mr. and Mrs. Stewart Phelps....Pittsburgh, Penna.
M. A. Gesner.....New York, N. Y.
Mrs. Edmondson Warrin .....Upper Montclair, N. J.
Andrew P. Duncan.....Washington, Penna.
George H. Brown.....New Brunswick, New Jersey
W. H. Henson .....Champaign, Illinois
Mr. and Mrs. Frederick Carder..Corning, New York
Mr. and Mrs. A. P. M. Fleming..Cheshire, England
S. E. Josi.....London, England

General Electric Denies That Lamp Patents Have Expired

Declaring that incorrect statements were made during hearings of the Senate Committee on Patents at Washington, the General Electric Company in a letter signed by Vice-President Albert K. Davis to the chairman of the committee has denied that all of the company's incandescent patents have expired or been invalidated by the courts or that the company has used its patents in any way to oppress independent manufacturers.

The statements referred to were made by independent lamp and tube manufacturers' representatives in the hearing on the Dill Bill now before Congress, which provides for the forfeiture of patent rights in case of conviction under laws prohibiting monopoly.

According to Thomas E. Robertson, Commissioner of Patents, and V. M. Dorsey, representing the Patent Law Association, the Dill Bill is too far reaching in its scope. It was designed to aid the radio industry, but would have the effect of disrupting other industries whose existence depends upon their patent rights.

Mr. Davis points out that two fundamental patents held by the company—the Just and Hanaman patent on the tungsten filament lamp, and the Langmuir patent on the gas-filled lamp—have neither expired nor been invalidated, but are still in force and effect. The Coolidge patent on ductile tungsten, the third important one covering the making of the modern incandescent lamp, is now in litigation; but, Mr. Davis says, whether this invention is patentable or not, it was a great contribution to the electric lighting art and was made at great expense by the General Electric Company.

In setting forth the company's defense against the charges made against it, Mr. Davis reviewed the history of the development of incandescent lamps at some length.

A. Solomon Organizes New Concern

The Seaboard Glass Corporation, 347-451 Communipaw Avenue, Jersey City, N. J., the incorporation of which was recently announced, is a subsidiary of the well-known importers, L. Solomon & Son, Inc., 199-201 Wooster Street, New York. The new firm, which began operations on March 1, will deal exclusively in window glass and in rough and rolled glass products. A large modern warehouse at the above address which will be the central headquarters and will contain also the executive offices has already been established. It is provided with a railroad siding and unusually good facilities for storing and distribution of large stocks of flat glass. It will carry, it is stated, the largest stock of window and rough rolled glass in the State of New Jersey.

A. Solomon, who is president of L. Solomon & Son, Inc., is also president of the new concern. He is one of best known men in the plate and flat glass field. Mr. Solomon's brothers, Jack and Jacob, are treasurer and secretary, respectively.

The establishment of this new business is in line with plans made by Mr. Solomon and his associates some time ago. It is the purpose of the new company to immediately establish branches in other cities, the location of the main warehouse being such that excellent service can be given to the country at large as well as special service to buyers in the Metropolitan district.

Glass Container Association Annual Meeting

The members of the Glass Container Association will hold a meeting, which will be the regular annual business meeting, at the Hotel Traymore, Atlantic City, on Thursday and Friday, April 26 and 27. Arrangements for headquarters have already been made with the Hotel Traymore.

Judge Jennings, in a notice recently issued to members, suggests that it will be well to make reservations early as the meeting comes at a time of the year when accommodations are not unlimited.

Senator Copeland of New York, formerly Health Commissioner of the City of New York and an authority on food and health questions, will address the meeting. Dr. Alexander Silverman, head of the Department of Chemistry, University of Pittsburgh, and a widely known glass technologist, will lecture on "The Technology of Glass." The lecture will be illustrated.

A special invitation to the ladies to attend this meeting has been issued. Atlantic City in April will be very beautful and a short vacation taken at this time will benefit all who attend. On Friday evening there will be a banquet and entertainment and possibly a separate dinner and entertainment for the ladies.

Must Label Each Light of Imported Glass

A ruling by the Treasury Department, that will compel foreign manufacturers and exporters of sheet glass to place a label on each light brought into this country to indicate the country of origin, was announced by the Secretary of the Treasury on February 10. Collectors of Customs have been notified that the ruling will take effect on glass imported after sixty days following the publication of the decision among the weekly Treasury Decisions.

Heretofore all window glass, plate, mirror plate, cylinder, rough rolled glass, dry plates and similar products have been deliverable when the boxes or crates containing them were marked to indicate the country of origin. This ruling was based largely on the fact that glass imported in large sizes has been cut to smaller sizes. It is now shown that window glass is imported in regular sizes and that it goes to the ultimate consumer in the sizes as imported and is not cut into smaller sizes, and that it is the practice of American manufacturers of window glass to mark each light with a label descriptive of the glass and indicating the place of manufacture.

Under the new ruling the buyers will be able to identify imported glass even in small sizes.

Hazel-Atlas Glass Report

The stockholders of the Hazel-Atlas Glass Company at their meeting in Wheeling, W. Va., on February 28, received the anual financial report which showed a substantial increase in profits over 1926, the largest ever previously recorded during the company's existence. Net profits amounted to $2,365,214, after deduction for Federal taxes, depreciation, etc., $375,000 was added to reserve and $1,482,284 was added to surplus, making the total $3,565,924 which is a record figure. Dividends at 8½ per cent amounted to $822 530.

Glassware Manufacturers Meet

The National Association of Manufacturers of Pressed and Blown Glassware held their annual meeting in Pittsburgh on March 13 and 14 and re-elected E. J. Barry of the Libbey Glass Manufacturing Company, as president and John Kunzler as secretary and treasurer. C. R. Roe of the Fostoria Glass Company is vice-president, J. D. Williams, Tarentum, Pa., treasurer, and Charles E. Voitle, Pittsburgh, assistant secretary.

The American Association of Flint and Lime Glass Manufacturers also held a meeting at the same place. Both associations appointed committees to draw up resolutions of regret on the death of W. A. B. Dalzell, of Fostoria Glass Company, whose many years of devotion to both organizations and whose services as president of the American Association had been deeply appreciated.

Tariff Rates on Glass

An oral announcement was issued from the office of the United States Tariff Commission, Washington, D. C., on March 8, to the effect that plans are being made to take up within a short time the readjustment of tariff rates on plate and window glass. The preliminary work of ascertaining foreign and domestic costs on plate glass has been completed, but the report has not yet been submitted to the President.

In regard to window glass, only the domestic costs have been ascertained and it will be necessary to wait for foreign cost data, which is expected to reach the Commission very soon. Soon after the data is studied by the Commission a date for a public hearing will probably be announced.

Florida Man Nominated for Tariff Commission

News of special interest to the window and plate glass trades was found in the announcement that Frank Clark of Miami, Florida, was nominated by President Coolidge on March 21 to be a member of the United States Tariff Commission. Mr. Clark succeeds Edward P. Costigan who recently resigned and who was declared by other commissioners to be a stumbling block to progress in the transaction of the affairs of the Commission. Mr. Clark is a Democrat and was recommended to the President by Senator Fletcher of the State of Florida.

February Plate Glass Production

Figures on the production of polished plate glass for the month of February, 1928, compiled by P. A. Hughes, secretary of the Plate Glass Manufacturers of America, show a production for the month of February, 1928 of 10,092,885 square feet, as compared with 8,205,297 square feet produced in January, 1928. The production for the corresponding month of February last year was 9,789,734 square feet.

Our Foreign Trade in Glass and Glassware

The monthly summary of United States imports and exports covering January and the six months' period ending December will be found on page 96 of this issue.

Advanced Prices on Plate Glass Fail to Hold

The manufacturers of polished plate glass who advanced their prices from 10 to 15 per cent in February have withdrawn the quotations and are now quoting at former levels.

Trade Activities

The Solvay Sales Corporation has moved its Pittsburgh office to 120 Clark Building.

The Standard Plate Glass Company's annual meeting will be held April 18, at Pittsburgh, Pa.

The Capstan Glass Company, Connellsville, Pa., has put an additional furnace into production.

The Pine Glass Corporation, Okmulgee, Okla, the organization of which was noted some time ago, is now manufacturing bottles.

The Brilliant Glass Company, Weston, W. Va., is busy on flashlight lenses for the Ever Ready Flashlight Company, large orders for this product having been placed with them.

The Rolland Glass Company, Clarksburg, W. Va., has obtained title to the Lafayette Window Glass Company in the same city. The latter plant has not been operated for some time.

The Hocking Glass Company, Lancaster, O., is reported to have increased its preferred stock from $500,000 to $1,500,000 and issued 180,000 shares of non-par common stock. The $900,000 of old common stock will be retired.

The Kearns-Gorsuch plant of the Hazel-Atlas Glass Company, at Zanesville, O., which has been operating at part capacity for several months, is reported to have increased operations to full production during March.

The Libbey-Owens Sheet Glass Company are reported to have started fires in their Lancaster, O., plant, recently taken over from the Fairfield Sheet Glass Company. Manufacturing operations will start early in April.

The Acme Glass Company, Lumberport, W. Va., is said to be preparing to manufacture glass cylinders for use in gasoline filling stations. They are equipping the plant that formerly belonged to the Mound City Glass Company.

Pressed Prism Plate Glass Company, Morgantown, W. Va., according to announcements, have resumed operations after being closed since December and, according a report attributed to Theodore D. Warrick, general manager, will employ about eighty workers.

The Brown Instrument Company, Philadelphia, Pa., manufacturers of pyrometers and other indicating and recording instruments for various purposes, announce the removal of their Detroit branch to 576 Maccabee Building. R. W. Mayer is district manager.

The Pennsylvania Bottle Company has applied for a charter to take over the Sheffield Glass Bottle Company's plants at Sheffield and Wilcox, Pa. As previously noted the reorganization and operation of the company is under the management of R. R. Underwood of the Knox Glass Bottle Company, Knox, Pa.

G. E. Paddock & Son, Wilkes-Barre, Pa., recently incorporated with a capital of $150,000, are erecting a new building in which to carry on their art glass business. This improvement has been rendered necessary by an increase in the company's business. G. E. Paddock is president, Dr. C. Murray Turpin, secretary, and W. G. Williams, treasurer.

The Austin Company, Cleveland, O., the largest firm of industrial engineers and builders in the United States, recently placed a contract with the Detroit Steel Products Company for their 1928 requirements of Fenestra steel sash. The contract calls for approximately 2,000,000 feet of steel windows. This is the largest single purchase of steel windows for industrial and commercial buildings ever placed.

Mattily Cut Glass Company, Toledo, O., is being incorporated by John F. Smythe, Joseph Hockie, L. M. Herron, all of whom were formerly employed by the Libbey Glass Manufacturing Company. This concern is the outgrowth of a partnership formed last year for the production of high grade rock crystal cut glass. An issue of 150 shares of stock of a par value of $100 each will be authorized.

The Pittsburgh Section of the American Ceramic Society held a joint meeting with the Pittsburgh Section of the American Chemical Society on March 15. Dinner was served at the Pitt Faculty Club. A motion picture "The story of Refractories" was shown at the Bureau of Mines and Francis C. Flint, chief chemist for the Hazel-Atlas Glass Company, Washington, Pa., gave an address on "Recent Developments in the Glass Industry."

Glass Mountain Products Company, organized by three Ritchie brothers of Klamath Falls, Oregon, announce that they are starting a small plant for the purpose of manufacturing novelties and articles such as decorative tiles, door knobs, mixing slabs and mortars from basaltic quarries of which Big Glass Mountain, Siskiyou County, Cal. is composed. Some of the material they plan to mine are: diatomatious and crystalline quartz, porphyrite, scoria and other substances.

The Roessler & Hasslacher Chemical Company, New York, N. Y., held a stockholders' and directors' meeting at their main office on March 6, at which time the following offices were filled for the ensuing year: W. A. Hamann, chairman of the board; Dr. H. R. Carveth, president; P. Schleussner, first vice-president; M. Kutz, second vice-president; Dr. M. J. Brown, assistant vice-president; C. Dill, assistant vice-president; A. Frankel, treasurer; A. Heuser, assistant treasurer and P. S. Rigney, secretary.

The Truscon Steel Company, Youngstown, O., announce the following appointments: C. I. Auten, who began as an engineer with the company seventeen years ago, has been named vice-president in charge of sales in the standard building division of the firm; M. T. Clark is vice-president in charge of sales of the steel window division, with which he has been identified for the last nine years and C. D. Loveland, formerly manager of the Pittsburgh district of the Truscon organization, is made vice-president with headquarters at Newark, N. J. He will be in charge of Truscon distribution in that state.

The American Manganese Producers Association, composed of all the largest manganese mining companies in the country, asserts that its object is to make the United States independent of foreign sources of supply of manganese, which material is still used to some extent in glass making. The association claims that it is fighting for the life of the United States manganese industry against concessionaires who have invested huge amounts of money in manganese mines in Russia. It aims to keep the United States independent of foreign manganese in time of war and stress and prepare the industry to meet any national emergency that may arise. The development of the manganese reserves of the United States is being made possible through the placing of a small import tax on manganese.

The Illinois-Pacific Glass Company, San Francisco, Cal., at the annual meeting on February 15, announced that under the arrangement for financing the construction of the new plant at Los Angeles, approved stockholders are authorized to buy the new Class A stock in the company at $30 a share, on the basis of one new share for each ten shares now held. This will make a total of 17,392 shares issued, producing a revenue of $521,760. Dividends will begin on the new stock on August 1 at the regular rate. The annual report showed earnings of $7.21 a share on Class A stock compared with earnings of $6.81 per share in 1926 before extraordinary deductions, or $4.94 after the deductions. The sales of the company in 1927 increased 5½ per cent over the previous year and 16 per cent over 1925. Manufacture proceeded at the rate of 16 per cent over that of 1916.

United States Glass Company reports for the year 1927 net loss from operations of $147,997, compared with net profit of $91,863 the previous year. Profit and loss surplus as at December 31, 1927, stood at $513,684 as compared with $759,851 at the end of 1926. In his report to the stockholders, Edwin E. Slick, president, says: "Since our last annual report improvements at Glassport, including the state road and bridge, are near completion and we will now make an effort to dispose of our Glassport Land Company property at its increased valuation. Expenditures for new equipment during the year amounted to $138,435. Settlement of royalty claims was made at $55,000, an amount decidedly less than claimed by the owner of the patents. Notes payable have been increased $210,000, which has been used for improvements, advertising, patent settlement and royalty claims." President Slick recently declared that prospects for the coming year are brighter than they were at this time last year. The first three months earnings are materially higher than for the corresponding period of 1927. New lines are being added to the company's products. At a meeting in Pittsburgh on March 21 H. M. Trimball and L. A. Meyran were re-elected to the board of directors for three year terms.

Industrial Publications

Corhart Cast Blocks. A 16-page pamphlet issued by the Corhart Refractories Company, Louisville, Ky., illustrating a number of actual installations of the new Corhart cast blocks in tank and bridge walls and showing their durability over long periods of operation.

Manganese. Bulletin 795-H of the United States Geological Survey, Department of the Interior, Washington, D. C., describes a recently discovered minable bed of manganese oxides in southern Idaho that had been deposited in a lake of the glacial period and later covered by 100 feet of silt. Up to May 1, 1927, it had yielded 1,200 tons of high-grade manganese ore.

Methods of Starting Squirrel-Cage Induction Motors and Synchronous Motors for General Industrial Applications. A multigraphed sixteen page report of a paper presented before the Lehigh Valley Section of the American Institute of Electrical Engineers at Bethlehem, Pa., and issued by the General Electric Company, Schenectady, N. Y. The author advocates a change from the long established method of starting squirrel cage induction motors and synchronous motors.

Type BTA Motors. A four page pamphlet issued by the General Electric Company, Schenectady, N. Y., describing motors designed to cover the field which requires an alternating current, adjustable speed motor with shunt characteristics. Among the typical uses for such motors is listed table drives for plate glass grinders.

Pyro Radiation Pyrometer. Bulletin No. 20. Pyrometer Instrument Company, 74 Reade Street, New York. A sixteen page pamphlet describing the principles on which this pyrometer is constructed and giving directions for its use. Radiant heat from the sight-hole falls on the thermo-couple and develops a proportionate electromotive force which actuates the "galvo" or millivoltmeter whose pointer is visible on the scale immediately over the eyepiece. Thermo-couple, telescope and millivoltmeter are so designed as to be enclosed in a simple, compact case.

Mercoid Controls. The American Radiator Company, Accessories Division, 816 South Michigan Avenue, Chicago, Ill., is putting out printed matter relating to Mercoid controls, which can be successfully applied to oil burners, starting and stopping motors, ovens, blowers, compressors, pumps, etc. These controls may also be used in sounding alarms relating to temperature, pressure and vacuum conditions, also for controlling office and plant temperatures and in drying rooms, ovens, etc. It is claimed that within its range of temperature this device gives very satisfactory results.

H-A News, is the title of a little house organ published by the Hazel-Atlas Glass Company at the general office, Wheeling, W. Va., Volume 1, No. 1, contains a number of features and a description of how H-A tumblers are made in the largest tumbler factory in the world. Some space is given to athletics with a talk on "The Why of Football" by Andrew Kerr, coach and athletic director of W. & J. College. Communications for the paper should be addressed to "The Old Colonel," care of the Company at Wheeling.

Recent Deaths

William G. Gundelfinger

William G. Gundelfinger, vice-president of the Diamond Alkali Company, Pittsburgh, Pa., died suddenly in Philadelphia on March 18 from pneumonia which developed after an operation for appendicitis, with which he was attacked while visiting that city. Mr. Gundelfinger was born in Pittsburgh in 1880. In 1912 he joined the Diamond Alkali Company, remaining with that company continuously. Mrs. Gundelfinger, a son and two daughters survive him.

Personals

Professor Alexander Silverman, Head of the Department of Chemistry of the University of Pittsburgh, delivered an illustrated lecture on "Glass" before the Erie Section of the American Chemical Society, on Monday, March 12.

T. E. Kirch is reported moving from Cincinnati, O., to Sheffield, Pa., to take charge of the former Sheffield Glass Bottle Company plant which recently passed into the possession of the newly organized Pennsylvania Glass Company. The old Sheffield plant has been idle for nearly a year and extensive alterations will be necessary before operations begin.

Coming Meetings

The American Ceramic Society's European tour will cover the period from May 19 to July 5, 1928, and will include visits to England, Germany, Czechoslovakia, France and Holland. The 1929 annual convention of the society will be held in Chicago.

The American Refractories Institute announced on February 29, too late for correction in the March issue, the fact that the date for the annual spring meeting of the Institute at White Sulphur Springs, W. Va., had been changed from May 16 and 17, as previously announced, to May 8 and 9.

The Pittsburgh Section of the American Ceramic Society will hold its next meet at the Mellon Institute on April 10. Dr. William McCaughey of Ohio State University will speak on "The Use of Pretographs and X-rays in Ceramics."

The National Lime Association will hold its annual convention at the Belmont Hotel, New York, May 23 and 24.

The Canadian National Clay Products Association will hold its 26th annual convention at Montreal, June 11, 12 and 13.

The **Eastern Division** of the **National Glass Distributors Association** will hold its next meeting in New York on April 25.

The National Lighting Equipment Exhibition of the Artistic Lighting Equipment Association will be held at the Hotel Sherman, Chicago, Ill., June 11 to 16.

The Glass Container Association will hold its regular annual business meeting at the Hotel Traymore, Atlantic City, Thursday and Friday, April 26 and 27.

What The World Wants

Specific Inquiries for American Goods Received in the Department of Commerce, Washington, D. C.

Egypt: 29951, bottles, flasks, etc., for the drug trade.

Chile: 30183, glass-making presses and molds.

Denmark: 30177, glass which permits passage of ultra-violet rays.

Inquiries Received

For further information address THE GLASS INDUSTRY

For further information address THE GLASS INDUSTRY.

407. Who makes glass wool for insulating and other purposes (Mar. 23).

408. Please give us the address of the manufacturer of the Loomis boot (Mar. 15).

Glass Stock Quotations

PITTSBURGH STOCK EXCHANGE, MARCH 22, 1928

Reported by Moore, Leonard & Lynch, Union Trust Building, Pittsburgh, Pa.

	Bid	Asked	Last
American Window Glass Machine, Com...	..	..	24
American Window Glass Machine, Pfd...	42	50	49⅞
American Window Glass, Pfd.....	..	90	90
United States Glass.....	13½	14	14½
Pittsburgh Plate Glass, Com.....	222	..	225
Standard Plate Glass, Com.....	..	..	5½
Standard Plate Glass:			
Preferred cumulative.....	..	..	24½
Prior preferred	..	..	33

TOLEDO, O., MARCH 22, 1928

	Bid	Asked	Last
Owens Bottle, pfd.....	115	..	116
Libbey-Owens Sheet Glass, Com.....	119	123	120½
Libbey-Owens Sheet Glass, pfd.....	115	..	116½

WHEELING STOCK EXCHANGE, MARCH 22, 1928

	Bid	Asked	Last
Hazel-Atlas	83½	84½	84
Imperial	..	..	72
Fostoria	208	..	208
Central	..	..	75
Jefferson, pfd.	..	..	96

READERS WANTS AND OFFERS

For Sale: CULLET of all Descriptions
Free from Caps, Wires, etc.
GEORGE F. BAUMANN, Dealer,
1110 Carroll Street, Brooklyn, New York.
Carloads Ready for Immediate Shipment.

WANTED, BACK NUMBER of The Glass Industry, January, 1923, Vol. 4, No. 1. Premium offered. Send particulars to 50 Church Street, New York.

Current Prices of Glass-Making Materials

March 20, 1928

Quotations furnished by various producers, manufacturers and dealers

		Carlots	Less Carlots
Acid			
Citric (dom.)	lb.	.44½	.44½
Hydrochloric (HCl) 20° tanks, per 100 lb.		..	1.10
Hydrofluoric (HF) 60% (lead carboy)	lb.	..	.13½
52% and 48%	lb.	.10	.10-.11½
Nitric (HNO_3) 38° carboy ext. Per 100 lb.		5.50	5.75
Sulphuric (H_2SO_4) 66° tank cars	ton	15.50	..
Tartaric	lb.	.37	.37½
Alcohol, denatured	gal.	..	.52½
Aluminum hydrate ($Al(OH)_3$)	lb.	.04½-.05	.05½-.06
Aluminum oxide (Al_2O_3)	lb	..	.07
Ammonium bifluoride (NH_4) FHF	lb.	..	.20
Ammonia water (NH_4OH) 26° drums	lb.	.03	.03¼
Antimony, metallic (Sb)	lb.	..	.10¾-.11
Antimony oxide (Sb_2O_3)	lb.	..	.14-.16
Antimony sulphide (Sb_2S_3)	lb.	..	.13
Arsenic trioxide (As_2O_3) (dense white), 99%	lb.	.04	.04¼-.04½
Barium carbonate ($BaCO_3$)			
Precipitated	ton	53.00	58.00
Natural, powdered, imported	ton	45.00	50.00
Barium hydrate ($Ba(OH)_2$)	lb.	..	..
Barium nitrate ($Ba(NO_3)_2$)	lb.	.08¼	.08½
Barium selenite ($BaSeO_3$)	lb.	..	..
Bone ash	lb.	.05	.05½
Borax ($Na_2B_4O_7 10H_2O$)	lb.	.03¾	.04-.04½
Boric acid (H_3BO_3)	lb.	.08-.08¼	.08¼-.08¾
Refined	lb.	.08-.08¼	.08½-.08¾
Cadmium sulphide (CdS)—			
Red	lb.	..	1.20
Orange	lb.	..	1.10-1.25
Yellow	lb.	..	1.20-1.40
Chromium oxide (Cr_2O_3)	lb.	.27	.28
Cobalt oxide (Co_3O_4)			
In bbls.	lb.	..	2.10
In 10 lb. tins	lb.	..	2.20
Copper oxide			
Red (Cu_2O)	lb.	..	.30
Black (CuO)	lb.	..	.25-.30
Black prepared	lb.	..	.30
Cryolite ($Na_3Al F_6$) Natural Greenland			
Kryolith)	lb.	.09	.10-.10½
Artificial or Chemical	lb.	..	.09½
Epsom salts ($MgSO_4$) (imported) Per 100 lb.		..	1.15-1.30
Feldspar—			
100 mesh	ton	13.00-20.00	15.50-22.00
80 mesh	ton	11.75	14.50
40 mesh	ton	11.00	13.50
Fluorspar (CaF_2) domestic, ground, 95-98% (max SiO_2, 2½%)			
Bulk, carloads, f.o.b. mines	ton	32.50	..
In bags or barrels	ton	36.50	41.50
Formaldehyde	lb.	.08¾	.09
Graphite (C)	lb.	..	.04-.07
Iron oxide—			
Red (Fe_2O_3)	lb.	..	.03¼-.07
Black (FeO)	lb.	.03½	..
Kaolin (f.o.b. mine)	ton	9.00	..
English, lump, f.o.b. New York	ton	13.00-23.00	..
Kryolith (see Cryolite)			
Lead chromate ($PbCrO_4$)	lb		
Lead oxide (Pb_3O_4) (red lead)	lb.	.08½ .08¾	.09½-.09¾
Litharge (PbO)	lb.	.07½-.09	.08½-.09¼
Lime—			
Hydrated ($Ca(OH)_2$) (in paper sacks)	ton	11.50-12.50	..
Burnt (CaO) ground, in bulk	ton	9.00	..
Burnt, ground, in paper sacks	ton	11.00	..
Burnt, ground, in 280 lb. bbls.	Per bbl.	2.15	2.30
Limestone ($CaCO_3$)		2.00	..
Magnesia (MgO)—			
Calcined, heavy (in bbls.)	lb.	.06	.07
light (in bbls.)	lb.	..	.23
extra light (in bbls.)	lb.	..	.37
Magnesium carbonate ($MgCO_3$)	lb.	.06	.08
Manganese 85% (MnO_2)	lb.	.04	.04½
Nickel oxide (Ni_2O_3), black—			
for nickel content	lb.	..	.35
Nickel monoxide (NiO), green—			
for nickel content	lb.	..	.35
Plaster of Paris, bags	ton	..	23.00
Potassium bichromate ($K_2Cr_2O_7$)—			
Crystals	lb.	.08	.08½
Ground	lb.	.11	.12
Potassium carbonate—			
Calcined (K_2CO_3) 96-98%	lb.	06¾	.07⅛
Hydrated 80-85%	lb.	.06	.06½
Potassium chromate (K_2CrO_4)	lb.	..	.28
Potassium hydrate (KOH) (caustic potash)	lb.	.07⅛	.08
Potassium nitrate (KNO_3) (gran.)	lb.	..	.05⅞-.06
Potassium permanganate ($KMnO_4$)	lb.	.15	.15½
Powdered blue	lb.	..	.24-.26
Rochelle salts, bbls.	lb.	..	.23
Rouge	lb.	..	..
Rutile (TiO_2) powdered, 95%	lb.	.15-.20	.20-.25
Salt cake, glassmakers (Na_2SO_4)	ton	22.00	..
Selenium (Se)	lb.	..	2.05-2.15
Silver nitrate ($AgNO_3$)	oz.	..	.40½-.42½
Soda ash (Na_2CO_3) dense, 58%—			
Bulk, on contract	Flat per 100 lb.	1.22½	..
In barrels	Per 100 lb.	1.55-1.57½	2.40
In bags	Per 100 lb.	1.37½-1.40	..
Spot orders..02½-.05 per 100 lbs. higher			
Sodium bichromate ($Na_2Cr_2O_7$)	lb.	.06¼	.06¾
Sodium hydrate (NaOH) (caustic soda)	Per 100 lb.	3.35	..
Sodium nitrate ($NaNO_3$)—			
Refined (gran.) in bbls.	lb.	.03⅞	.04½
95 per cent.	Per 100 lb.	2.32½	2.75
Sodium selenite (Na_2SeO_3)	lb.	..	2.35
Sodium fluosilicate (Na_2SiF_6)	lb.	.04¾	.05½
Sodium uranate (Na_2UO_4) Yellow or Orange	lb.	..	1.25
Sulphur (S)—			
Flowers, in bbls.	Per 100 lb.	3.45	3.80-4.00
Flowers, in bags	Per 100 lb.	3.10	3.45-3.65
Flour, heavy in bbls.	Per 100 lb.	3.85	3.20-3.40
Tin chloride ($SnCl_2$) (crystals)	lb.	.39	.41½
Tin oxide (SnO_2) in bbls.	lb.	..	.56
Uranium oxide (UO_3) (black, 96% U_3O_8)			
100 lb. lots	lb.	..	1.25-2.25
Zinc oxide (ZnO)	lb.	.06½-.08½	.12
Zircon			
Granular (Milled .005-.02c higher)		.07	.07½-.08
Crude, Gran. (Milled .005-.02c higher)		.03½	.04-.05

Monthly Summary of United States Foreign Commerce in Glass

EXPORTS

Corrected to February 24, 1928

		January 1927 Quantity	January 1927 Value	January 1928 Quantity	January 1928 Value	Six Months Ending December 1926 Quantity	Six Months Ending December 1926 Value	Six Months Ending December 1927 Quantity	Six Months Ending December 1927 Value
Glass and glass products (total)		.....	$704,177	.....	$716,533	.....	$4,735,473	.....	$4,451,693
Plate and window glass—									
Window glass, common, box 50 sq. ft.		2,361	14,860	796	5,833	13,543	87,803	10,846	54,792
Plate glass, unsilvered, sq. ft.		113,339	30,879	92,327	34,934	168,518	77,224	574,035	186,788
Other window and plate glass	lbs.	414,901	29,312	208,151	32,933	1,843,242	156,356	2,014,748	203,329
Glass containers (bottles, vials and jars)		.....	194,470	.....	255,814	.....	1,708,147	.....	1,568,255
Table glassware, plain		.....	123,957	.....	97,363	.....	844,465	.....	691,767
Table and other glassware, cut or engraved		.....	8,341	.....	9,874	.....	77,962	.....	73,469
Lamp chimneys and lantern globes	lbs.	204,669	48,203	189,146	34,401	865,535	169,085	847,938	168,468
Globes and shades for lighting fixtures	lbs.	159,096	52,005	117,856	41,205	898,370	319,044	814,568	297,495
Chemical glassware	lbs.	16,649	14,076	51,156	17,179	117,414	105,315	125,261	108,024
Electrical glassware, except for lighting	lbs.	170,973	24,212	206,998	29,051	1,645,422	207,031	1,039,516	122,879
Other glassware		.....	163,862	.....	157,946	.....	983,041	.....	976,427

IMPORTS

Corrected to February 24, 1928

Glass and glass products		.....	$1,385,205	.....	$929,683	.....	$10,629,306	.....	$8,769,559
Cylinder, crown and sheet—									
Unpolished	dut. lb.	.....	.....	.....	.....	41,652,180	1,441,263	.....	.....
Weighing less than 80 pounds per case	dut. lb.	3,641,425	98,769	2,893,959	88,090	.....	.....	21,437,437	585,310
Weighing 80 pounds or over per case	dut. lb.	3,481,338	213,397	2,176,334	110,997	.....	.....	14,437,690	645,551
Bent, ground, beveled, colored, painted, etc., and polished	dut.	.....	43,341	.....	31,039	.....	249,219	.....	187,470
Plate glass	dut. sq. ft.	.....	.....	.....	.....	12,690,213	4,259,262	.....	.....
Polished, unsilvered	dut. sq. ft.	1,357,060	497,404	808,559	178,109	.....	.....	6,577,974	1,704,103
Other	dut. sq. ft.	110,880	27,175	89,806	23,877	.....	.....	778,558	188,747
Bottles, vials, jars, demijohns and carboys, molded or pressed	dut.	.....	23,571	.....	21,602	.....	106,732	.....	94,365
Table and kitchen utensils	dut.	.....	17,655	.....	11,867	.....	81,542	.....	142,144
Glassware, cut or decorated	dut.	.....	192,626	.....	181,553	.....	1,752,577	.....	2,108,950
Blown glassware, n. e. s.—									
Bottles, ornaments, gauge glasses and other n. e. s.	dut.	.....	63,907	.....	66,724	.....	1,263,986	.....	1,454,971
Bulbs for electric lamps	dut. No.	1,163,877	11,871	1,391,119	14,261	8,413,465	91,275	7,681,050	89,110
Chimneys, globes, shades, prisms and other illuminating glassware	dut.	.....	77,884	.....	61,810	.....	500,129	.....	538,285
Articles and utensils for chemical, scientific, and experimental purposes	dut.	.....	35,775	.....	42,621	.....	241,139	.....	268,234
Other glassware	dut.	.....	81,830	.....	97,133	.....	642,182	.....	762,319